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A Weekly Journal Devoted to Industrial & Engineering Chemistry

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NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Other communications relating to advertisements or general matters should be addressed to the Manager.

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Organised Chemists and Labour

THE conference to be held in London to-day to consider the formation of a National Federation of Professional, Technical, and Supervisory Workers raises important questions of policy for all organised chemists, whatever particular body they happen to belong to. The general idea is the promotion of at least a good understanding—if not a definite alliance—between the "brain" workers and the "manual" workers of the country on the basis of a broad labour party. We are able to publish this week a number of messages on the subject, specially contributed by representative men to THE CHEMICAL AGE. These communications are a real help to the formation of a clear judgment on the matter, because they throw light on the proposal from two distinct points of view. On the one side we have the opinions of six well-known Labour members of Parliament—Mr. J. R. Clynes, Mr. Arthur Henderson, Mr. John Hodge, Mr. W. Brace, Mr. W. Thorne and Mr. J. Wignall—who approach the matter quite frankly from the Labour point of view. On the other side we have an equally frank expression of opinion from Mr. Searle, representing the National Association of Industrial Chemists, and Dr. Rodd, honorary editor to the British Association of Chemists, together with some abstracts from Mr. Pilcher's recent work, "The Profession of Chemistry," indicating the views of the registrar of the Institute of Chemistry. Let us see how these two sets of views touch and react upon each other.

It will readily be admitted that the six Labour leaders who have kindly furnished these short statements of opinion represent the fairest and more constructive type of mind in the Labour party of to-day. Their appeal is frankly to all professional—that is, scientific, intellectual, or managerial—workers to join hands with the manual workers, "not merely for personal improvement, but for a higher level of national prosperity." To quote Mr. Henderson—

> Professional workers can help to introduce a new method and motive in the conduct of industry by organising themselves on the lines of the trade unions and in co-operation with them. Organised labour has realised that its aims cannot be attained without this co-operation. It has, therefore, broadened its basis and has given a wider connotation to the term "Labour." Its industrial and political objectives are not, and have never been, to serve the interests of one class at the expense of the community, but to abolish class-domination in all departments of social life. The trade union representatives on the National Industrial Council, for example, have tried to include workers in a position of responsibility and trust—the supervisory and administrative staffs, technicians and others—in the Hours Bill; and we shall be successful in such efforts in the degree to which these classes of workers are organised and work in conjunction with the trade unions for the achievement of common aims.

We see nothing at all discreditable to these members in the fact that they work through politics for the achievement of their ends and offer overtures to the professional classes to join forces with them. At the same time, the new policy marks a notable advance in Labour thinking. It means shortly three things—(1) That the Labour party has outgrown its old view that Labour means simply manual toil; (2) that Labour without the scientific and professional worker may have the numbers, but lacks the creative and administrative forces of industry; (3) that, if it is to carry the country, Labour must carry the higher type of worker with it, and that it recognises the need of broadening the basis of action.

Now we turn to the other side, and ask how all this appeals to the existing bodies of organised chemists. Both Mr. Searle and Dr. Rodd write in a high critical temper, not wholly free from a trace of suspicion. Both are clearly on their guard against being "captured." It is clear that, while in one case at least the trade union principle is definitely accepted, neither organisation is prepared to merge itself in the manual labour movement, still less to pledge its support to a political party. Mr. Searle, in his very clear analysis of the position, credits us with more advanced opinions than we hold. The objection of the professional class

to organise themselves on the trade union principle is, we believe, steadily passing; but in their interpretation and application of that principle it by no means follows that they must fetter themselves with all the restrictive methods of industrial trade unionism. The tendency among scientific and literary professions is rather to combine among themselves, and to interpret the trade union principle to the conditions of their own professions in their own way.

Apart from sentiment, there is a specific point of divergence in the doctrine of the restriction of output. To the scientific investigator or to the literary man, the idea of "downing tools" at a given moment is impossible. The very life of such men is in their work, and their inspiring motive the advance of knowledge and thought. Human progress depends on the efforts of such workers, and any attempt to regulate down to a fixed standard the output of their minds would be anti-social in the worst degree. Hitherto the Labour party has failed to take account of this, and until it does the dividing line must remain. In such a field as chemistry there is room, and indeed need, for a combined effort to establish a reasonable minimum in the matter of remuneration and conditions; but beyond that there must be full liberty for personal enterprise, industry, and initiative. The present movement from the Labour side is welcome, as indicating a broadening outlook on life; but the liberalising process will need to be carried much farther before it is likely to absorb the whole body of the nation's workers.

The Business Side of Chemistry

A PAPER recently contributed to the Chicago Section of the American Chemical Society sets one thinking whether the scientific institutions in this country might not do well to descend occasionally from their pedestals and discuss the more worldly problems of business. The primary function of the industrial chemist is to perfect the manufacture of commodities essential to life and industry; but once such commodities are produced they have to be sold, and there can be no loss of dignity in making an auxiliary study of the science of salesmanship. At the Chicago meeting the Paper which aroused most interest was that read by Mr. Otto Eisenschiml on "The Business Side of Chemistry," and his remarks deserve the attention of all engaged in the chemical and allied industries in this country. The author remarked that technical colleges and universities dismiss their graduates with the impression that their earning power will be in direct ratio to knowledge and chemical ability. Such is far from being the case, for chemical knowledge must be sold and, in order to bring in handsome returns, must be sold cleverly. Now that chemists are demanding recognition and a living salary the point is well worth attention in this country. We are accused of being a nation of shopkeepers, and this being the case the man who runs the shop will always judge of the value of his lieutenants, not by their ability to patent new processes, but by their capacity to effect a substantial increase in turnover.

The American view is that a chemist who does not know the market value of every ingredient he handles is imperfectly qualified—he can never expect to be more than a servant of industry; but amongst the so-called "professional" classes the notion is too prevalent that one brain cannot hold both common sense and applied science. As it is, the theoretical man frequently furnishes the business man with advice on which the latter makes a hundred times the amount of the fee, and so long as this is the case so long will the chemist continue to cry in the wilderness for a respectable wage. That industrial rather than academic pursuits provide the readier avenue to financial affluence may be gathered from the remarks (which appeared in our last issue) of Sir Theodore Cook in connection with three professors at Armstrong College who had been lured away by commercial undertakings. The same thing is happening in America, where professional chemists of high standing are everywhere taking up business appointments, and the tendency is viewed with alarm and as contrary to the best interests of the country. The main ambition in life of the average man is to make comfortable provision for himself, and it only requires a wholesale repetition of the Newcastle experience to arouse the authorities of universities and other educational bodies to a sense of their duty. It must not, of course, be assumed that commercial undertakings are prepared to absorb an unlimited number of theorists. They are on the look-out for the man who combines high scientific training with a mind for business, and the intending aspirant should so equip himself as to become to his employer an asset and not a liability.

English Oil Prospects

ON several occasions we have reminded our readers that the operations at present being conducted in this country in connection with the quest for oil must be regarded as experimental. In many cases those who are interested in the search have frankly stated that until very much further knowledge of the deposits is obtained no definite opinion can be given as to the commercial prospects of the venture. Attractive pictures of wealth and prosperity have been drawn, and shares in some concerns stand at many times their par value, but it should be remembered that the high value of these shares is based on future prospects which may, of course, be sound enough if all the theoretical calculations turn out as anticipated. The technical man is quite capable of appreciating that in practice mere theoretical conceptions have an irritating habit of going awry; the layman, more apt to overlook this point, sometimes has to pay for his experience.

If any of our readers should be contemplating a "flutter" in home-produced oil they might do well to read what Sir J. W. Gregory has to say about the matter in a recent issue of the *Contemporary Review*. He may certainly be considered an authority on such problems, and one whose impartiality on the matter is unquestionable. Speaking of the Hardstoft area, Sir John says that much larger quantities of oil will have to be obtained to make the borings successful, for the yields discovered as yet are not very promising, and he reminds us that the flows are comparable to the temporary gushes which have occasionally been encountered in the Midland coalfields, and not to such oil springs as those of California, one of which wells

bored in 1914 discharged over a million gallons per day. Speaking of the King's Lynn area, Sir John draws attention to the fact that the shales contain 6 per cent. of sulphur. That oil can be obtained in this area is not doubted; but its future depends upon its quality and its price. It is pointed out, moreover, that while the elimination of sulphur is feasible as a laboratory process, at present there is no commercial process for purification. Efforts to discover such a process were made in Glasgow 50 years ago, and the attempt has been repeatedly renewed, but Sir John does not despair of ultimate success. Recently, it has been claimed that by deeper mining a shale of lower sulphur content has been struck, and this corresponds with the evidence that, possibly, the Kimmeridge clay, somewhere along its range between Dorset and Lincolnshire, may include beds which were deposited under different geological conditions and which would yield a better oil. Even if such beds exist, however, their extent has yet to be proved, and this can scarcely be done by the sinking of a comparatively few bore-holes.

Meanwhile, it is interesting to note, from some remarks in the "Board of Trade Journal," that in America the manufacture of oil from shale is destined to assume, in the not very distant future, a more prominent position than it now occupies. The necessity for increased exploitation of the shales would seem to be due to the fact that the U.S. oil reserves are showing signs of exhaustion. In fact, one authentic report states that the underground reserves are 40 per cent. exhausted, while in all probability production from drilling has attained a maximum. Another report goes so far as to say that, as the demand for oil will approximate to 800 million barrels in 1927, all reserves will be exhausted by 1928. That the future is regarded with some anxiety may be gathered from the fact that the U.S. Government has taken steps to reserve for naval purposes about 130,000 acres of shale country.

British Dyestuffs Policy

THE proposals of the Manchester Chamber of Commerce respecting the dyestuffs industry in this country would, if adopted, have the serious disadvantage of throwing the whole business back into the melting pot. The complaints against the present organisation of the industry and the demand for its subsidisation by the State as "the only satisfactory way of firmly and permanently establishing the dye-making industry in this country" are made in the interests of the British consumer. The consuming class, it may be admitted at once, find considerable difficulty in obtaining the requisite supplies at convenient prices; but a corresponding difficulty exists in America and in every other country which is trying to develop its home production up to the point of its home requirements. In various matters of detail there may be good ground for dissatisfaction and for the introduction of reforms. In that case, inquiry should show what is wrong and what steps are required for amendment.

The Manchester proposal, however, goes far beyond detail; it would change drastically the relation of the State to the dyestuffs industry, and involve a reopening of the whole question of national policy. Such a step, to say the least, would be risky; it might easily end in making the position worse instead of better. One of the most serious risks would be that of arresting the growth of the existing organisation which, as we showed in a recent article, has in a very short time gone a long way towards making this country independent of foreign supplies. It is futile to retort that it has not gone the whole way, because no other organisation could have done so in the time. All through this controversy the ultimate end of British policy should be kept steadily in view. That end is to build up a self-dependent home dyestuffs industry sufficient for home needs, if not for export needs also. It can only be built up gradually. The work will call for patience, and no doubt some temporary sacrifice on the part of the home consumer; but, unless we are prepared to pay the price, the ultimate end cannot be obtained. In that case, we run the risk of losing much of what has been already gained, and we should find ourselves in the end very much in the conditions of pre-war days. It was to protect the country from ever reverting to those conditions that the present policy was adopted. The alternatives were fully considered and a settled plan decided on. The typical British way in such matters is to stick to the accepted plan and see it through.

The Calendar

Feb. 10	Society of Chemical Industry (Edinburgh & East of Scotland Section): "The Structure of the Atom." Professor James Walker, F.R.S.	Edinburgh.
10	Manchester Municipal College of Technology (Department of Applied Chemistry): "The Separation of Oxygen, Nitrogen and Rare Gases from Air by Liquefaction." C. R. Houseman. 4.30 p.m.	Manchester.
10	Sheffield Association of Metallurgists and Metallurgical Chemists: "The Action of Solvents on Coal." R. J. Sarjant.	Sheffield.
12	British Chemical Trade Association: Chemical Trades Dinner. 7 p.m.	Criterion Restaurant, London.
12	Society of Chemical Industry (Birmingham & Midland Section): "Catalysis from an Industrial Standpoint." Dr. E. B. Maxted. 7 p.m.	University Buildings Edmund Street, Birmingham.
12	Association of Engineering and Shipbuilding Draughtsmen (Chesterfield Sub-Branch): "The Design of Regenerative Gas-Fired Re-heating Furnaces." J. W. Spedding. 7.30 p.m.	Grammar School, Chesterfield.
12	Society of Dyers and Colourists (Bradford Junior Branch): "Fastness of Gambines," H. Robinson; "The Finishing of Dress and Coating Fabrics." J. Wraith.	Bradford.
12	Society of Chemical Industry (Bristol & South Wales Section): "Cement," J. V. Watts. 7.30 p.m.	Chemical Department, The University, Woodland Road, Bristol
12	Royal Society: "Colloidal Electrolytes: Soap Solutions and their Constitution." J. W. McBain and C. S. Salmon. "The Viscosity of Sulphur." C. C. Farr and D. B. Macleod. 4.30 p.m.	Burlington House, Piccadilly, London.
14	North of England Institute of Mining & Mechanical Engineers: General meeting. 2 p.m.	Newcastle-on-Tyne.

Should Professional Workers Unite With Labour?

Representative Opinions from Labour M.P.s and Chemists' Organisations

In Essex Hall, London, to-day (Saturday) an interesting conference will be held "to form a national federation of professional, technical and supervisory workers." The idea is to promote a friendly understanding, if nothing more, between "brain" workers and "manual" workers on a common labour platform. As the chemical associations have been invited to take part and the question to be discussed has an immediate bearing on the policy of these associations, we have invited the opinions of a number of representative men on the subject, and some of these are reproduced below. From the Labour side, the case is stated in messages from Mr. J. R. Clynes, M.P., Mr. Arthur Henderson M.P., Mr. John Hodge, M.P., Mr. W. Brace, M.P., Mr. W. Thorne, M.P., and Mr. James Wignall, M.P.

From the point of view of organised chemists, opinions of a frankly critical character are contributed by Mr. A. B. Searle, honorary secretary of the National Association of Industrial Chemists, and Dr. E. K. Rodd, honorary editor of the British Association of Chemists. In addition, we quote some passages from Mr. R. B. Pilcher's recent book, "The Profession of Chemistry," which, we believe, represents the author's present views. The matter is referred to in our editorial notes.

I.—Labour Leaders' Proposals

The Rt. Hon. J. R. Clynes, M.P.

No modification in industrial or social conditions, and no absolute change which the Labour Party may be able to enforce in our economic structure can prejudice the rights or interests of the professional classes, whose brains are being used in constructive and necessary work.

Large numbers of able men employed in the most essential businesses and professions are very badly paid and ill-treated under existing conditions, and it is because there is an identity of interest between the manual worker and the brain worker that Labour calls upon both, who are often the victims of present day conditions, to join together not merely for personal improvement, but for higher level of national prosperity.

J. R. Clynes.

The Rt. Hon. Arthur Henderson, M.P.

The interest taken in the forthcoming conference of professional associations to consider the establishment of a federation which will form a link between administrative, technical and supervisory workers and the industrial unions is a significant fact. The conference itself has no special political purpose to serve, but it has emphasised the strong tendency of both the industrial and the political movement to bring the brain-workers and manual workers together in a common effort to improve their economic status and to prepare for the reorganisation of industry on the basis of democratic control.

Professional workers can help to introduce a new method and motive in the conduct of industry by organising themselves on the lines of the trade unions and in co-operation with them. Organised labour has realised that its aims cannot be attained without this co-operation. It has, therefore, broadened its basis and has given a wider connotation to the term "Labour." Its industrial and political objectives are not and have never been to serve the interests of one class at the expense of the community, but to abolish class-domination in all departments of social life. The trade union representatives on the National Industrial Council, for example, have tried to include workers in a position of responsibility and trust—the supervisory and administrative staffs, technicians and others—in the Hours Bill; and we shall be successful in such efforts in the degree to which these classes of workers are organised and work in conjunction with the trade unions for the achievement of common aims.

Arthur Henderson.

The Rt. Hon. John Hodge, M.P.

In the iron and steel trades with which I am familiar, the chemists employed in the laboratories have been very badly remunerated indeed. Only recently have they attempted anything in the way of organisation, but when one realises the great part chemistry plays in manufacture, no class of work should be better paid.

We have taken a number of these men into our ranks, and our hope is that the great majority of them may see the necessity of complete organisation if they hope to occupy a place worthy of their professional knowledge.

John Hodge.

The Rt. Hon. W. Brace, M.P.

The Labour movement has been created with the emancipating agent for labour. When I use the term labour I mean all those who work with brain and hand. It is the joint production of brain and hand workers which is the source of all wealth. Unity of these two is essential for effective production, and unity equally close and comprehensive will alone secure a just distribution of the wealth produced by their co-operative labours.

William Brace.

Mr. W. Thorne, M.P.

I am pleased to learn that the Chemists are about to form an industrial organisation to their own industrial and economic interest. It is quite impossible for any section of the community to do their best individually unless they are organised as a collective body for the purpose of taking collective action to help the collective interest. If the wage earners in the different parts of the country had no organisations, in the strong general unions, their position would have been very much worse. Industrial and political organisations are the only salvation of the wage earners.

W. Thorne.

Mr. James Wignall, M.P.

It is a sign of the times—and a good sign—that journals of the standing of The Chemical Age are alive to the necessity of impressing upon the "professional" class of worker the need of identifying themselves with the Labour movement.

The new constitution of the National Labour Party extends its invitation to brain workers as well as to those who labour with their hands, and if the invitation is responded to, as it deserves to be, the result should be a strong, virile combination.

I have long entertained the opinion that if what is known as the "professional" class linked itself with the Labour Party, it would, by so doing, help materially in improving the lot of the toiler—whether hand worker or brain worker—throughout the Kingdom.

James Wignall.

II.—Organised Chemists' Views

National Association of Industrial Chemists

There can surely be no doubt in the minds of those who have carefully considered the matter in all its bearings that if the "brain workers" of the country are to meet and overcome the present trend of political opinion in so far as it affects their earned incomes, they must unite in some way. Yet any such union—whatever may be its name—will inevitably have to inculcate principles which are almost identical in many respects with those of the well-known trade unions.

There is a natural aversion in the minds of many professional men to being associated with a trade union, but apart from the name there is little real aversion to the idea. Moreover, other professional men have long ago adopted the idea—under another name—and we are now so accustomed to the "close professions" of the law and medicine that we sometimes fail to realise that they are, in all essentials, trade unions of the strictest types.

The inclusion of so many professors and other purely professional men in the membership of the National Union of

Scientific Workers will cause many chemists who might have hesitated for a "lead" to feel that if such academicians can join such a union there can be little objection from the academic side. Where, then, is the objection to a Trade Union of Chemists which shall include all laboratory workers from the youngest boy, engaged in reading polariscopes or making tests of carbon by Eggertz' colour test, to the chief chemist of some important institution—no matter whether it be academic or industrial?

I suggest to you, Sir, that it is not the idea of union to which chemists object, but to many of the aims and objects of a particular political party which has—in the public mind—been specially associated with workmen's unions under the somewhat inaccurate title of "Trade Unions," whereas such unions are not trade unions at all in the strict meaning of the term.

A considerable number of chemists of my acquaintance certainly do not favour the suggestion made in a recent isssue of THE CHEMICAL AGE that "the prejudice of professional workers against a frank alliance with 'labour' is gradually giving way," and so far as the only properly registered trade union* for chemists is concerned (*i.e.*, The National Association of Industrial Chemists) there is no intention whatever of regarding its members as workmen in the commonly accepted sense.

The fact is, there are three distinct groups of people in all large industrial concerns—(1) the capitalists who provide the money, (2) the management, including the supervisors, planners, chemists and other testers and inspectors, and (3) the workers whose chief duty is to do what they are told to do. An employers' association is not regarded as "pandering to labour" as a necessary part of its existence, nor is it anathematised as a "trade union" to which it is undignified to belong. In the same way, a union for the management and supervisory section—to which chemists belong—has its interests quite apart from those of labour. Moreover, just as the Directors' Association exists to protect the rights of directors, and yet is not considered to be derogatory or related to a workman's union, so an association for chemists, if properly constituted, has a right to be respected.

No one would regret more than myself if any articles in THE CHEMICAL AGE should seem to imply that chemists are seeking to adopt the policy which has characterised the "labour" party or that the National Association of Industrial Chemists is likely to adopt such a policy in the near future. This Association became registered as a trade union in order to strengthen its position with the Government; it adopted the straightforward and legal course in so doing, but it did not and does not by such registration necessarily ally itself with any other trade union with political aims and aspirations. Its main object is to ensure that its members—and indirectly all chemists—shall work under proper conditions, shall have reasonable prospects of advancement and suitable rates of pay, and if these can be secured by legitimate means it intends to use all its powers to obtain them. It has, however, set down as a fundamental principle of policy and work that there must be a special section in every industry to which chemists necessarily belong, and that in all considerations of the future of any industry in which chemists are engaged this division into three distinct parties, as set out above, must be properly taken into consideration. For this reason, the practical politics of this Association will differ very widely from those of any of the existing trade unions, for workers and chemists, as a class, will do well to avoid anything which savours of "flirting with Labour," as this will only lead to disaster in the end.

Now is the time when chemists of all ranks have an unprecedented opportunity for placing their true position before the public as well as before their employers and the men who work more or less under their supervision. This opportunity will be lost if chemists begin to consider themselves as mere workmen, and once lost, it may never be regained. Chemists, along with other "brain workers," must form their own "trade unions" and federations of unions, and, as a matter of fact, such a federation has been in existence for some time, the British Association of Chemists, the National Union of Scientific Workers and the National Association of Industrial Chemists being properly represented on it. Your readers will therefore see that the interests of chemists are already being well cared for in the directions indicated, and that all that individual chemists now need to do is to see that they qualify for admission into this Association which is their duly registered "Trade Union."

ALFRED B. SEARLE, Hon. Sec.

* Various other professional associations which are endeavouring to interest chemists which have not been registered as trade unions are not, strictly, trade unions at all, but merely claim to be. In the present state of the law any group of people may term themselves a trade union, but the Government only recognises and provides for those which are duly recognised under the Friendly Societies Acts, and apart from quibblers whenever the term "trade union" is used it is always understood to mean a duly constituted trade union which has been so registered. The distinction is important because the Registrar is prohibited from registering two associations having the same or very similar objects and likely to be confused with each other.

The British Association of Chemists

The attitude of the British Association of Chemists towards the proposed new Federation of Professional Associations, as disclosed at a discussion held in Manchester last Friday, might be described as sympathetically critical. Those who have acted in official capacities for the B.A.C. during the past two and a half years know how difficult has been the task of getting chemists to sink their differences and unite for their common interests. The light in which prominent members of the B.A.C. regard the proposed federation of bodies of extremely diverse interests cannot fail to be coloured by their past experiences. The step which is now being taken by the Labour Research Department was anticipated by the B.A.C. in a more restricted manner some time ago. This association was then—as it still is—giving much attention to the question of the representation of chemists or, more broadly, the technical staff, on Whitley Councils. The committee appointed to deal with the matter early formed the opinion that we stood little chance of achieving our ends until we had strengthened our hands by enlisting the sympathy and obtaining the active support of other associations of technical workers. In spite of many difficulties a federal body was at length brought into being called the Federation of Technical and Scientific Associations, including, besides the B.A.C., the Electrical Power Engineers' Association, the Electricity Supply Commercial Association, the National Association of Industrial Chemists, the National Association of Supervising Electricians, the National Union of Scientific Workers, and the Society of Technical Engineers. This federation now has a definite constitution and a definite policy.

At the meeting of the Manchester Committee last Friday it was unanimously agreed that every effort should be made to continue the existing federation. The new federation proposes to embrace a number of numerically very strong clerical unions, any one of which far outnumbers the combined scientific and technical organisations. As is well known, the voting in these vast federations goes by heads, and, for all the influence they would have, the scientific and technical associations might as well stay outside. The opinion was pretty general that an entirely separate organisation is necessary for technical workers, whose training and interests diverge considerably from those of the non-technical workers. It might be possible to devise some system of confederation by means of which the technical and non-technical workers might be kept in touch, so that joint action might be taken when necessary. If the three-party scheme for Whitley Councils ever materialises some such contact will be necessary, for the technical and commercial interests of an industry will have joint representation on the councils, and will have to elect their representatives jointly.

The fact that several of the Associations which took part in the preliminary conference under the chairmanship of Mr. G. H. D. Cole are affiliated to the Trade Union Congress has undoubtedly given rise to the suspicion that the new movement is not entirely non-political, although Mr. Cole has averred that this suspicion is groundless. Chemists are certainly not prepared to commit their professional association to any political party, and this may account for a tendency to suspend judgment on the new movement until after the conference on February 7. The B.A.C. will await the report of its representatives at that meeting with considerable interest.

E. K. RODD, Hon. Editor.

Mr. Richard B. Pilcher

We quote the following abstracts bearing on this subject from "The Profession of Chemistry," by Mr. Pilcher, Registrar of the Institute of Chemistry :—

The poor remuneration of industrial chemists in the past has been due, in many cases, to the fact that their work often consists largely of routine analysis which can be carried out sufficiently well by youths who have had a short training in a limited variety of analytical processes and who are willing to accept positions affording them experience. An analyst in charge of a fairly large laboratory may occupy a reasonably remunerated position ; but for routine work there is a limited value. The well-trained man needs to secure a position commensurate with his attainments, which was formerly a difficult matter while the demand for such chemists was small. It is often very necessary to remind the chemist that his sphere need not be restricted to the operations of the laboratory. If it should be his ambition to occupy a controlling position in industry, he should lose no opportunity of becoming acquainted with processes on the manufacturing scale ; but if he finds his outlook restricted to analysis with no opportunity for developing ideas of his own, and no prospect of going on the works, he is well justified in seeking another appointment. . . . There is not and cannot be "a minimum wage" acceptable generally to men of such varied attainments ; but a scale might be agreed upon, to be varied according to economic conditions, having regard to the education, training, qualifications and experience of the chemists, as well as the character, importance, and responsibility of the work entrusted to them.

The difficulty of dealing with the rate of remuneration of chemists is apparent, for the limits of capability and the tasks to be allotted in scientific work cannot be determined as in the mechanical crafts. A "minimum wage" or "flat rate" would tend to affect adversely those who are more capable and more energetic ; there will always be some, even among those engaged on routine testing, more capable than others, more trustworthy, quicker in their work, and keener to make progress in their science. It is difficult to imagine chemical practice being subject to control, as to time and output, on the lines of the usual trade union system, and it may be questioned whether men who hope eventually to attain positions of responsibility in their profession would for long be content to submit to any system tending to restrict initiative and ambition. The chemist who really cares about his science is not likely to leave an experiment for the reason that he has completed so many hours to the day ; though, of course, there should be mutual understanding—some idea of "give and take"—between him and his principals.

We incline to the view that the varied nature of chemical practice and the different degrees of competency which can find employment in it make the idea of a "trade union" in the ordinary sense practically unworkable. We regard chemistry as a profession in which the practitioners must rely for success mainly on their individual capacity, skill, and force of character. Those who occupy whole-time positions will be successful only by proving their worth and by showing themselves able and willing to co-operate to the full in the progress of the concerns to which they are attached. A general strike among chemists would be a calamity—a greater calamity than many imagine ; but it is hardly feasible while the majority of well-qualified chemists are not dissatisfied. Yet it is quite possible for chemists to learn how their brethren are treated in various concerns. A company may be known by the chemists it keeps.

The founders of the Institute of Chemistry had no trade union idea in view. They hoped by promoting thorough education and training to provide a body of men—competent in their respective branches of chemical work—to whom the public could look with confidence for help in all matters on which chemical science has a bearing. An organisation composed of such varied members—including chemical consultants and analysts in general or specialised practice, chemists in Governmental or other official appointments, chemists in industries, as directors, owners, or as analysts, research chemists or control chemists, professors and teachers—can hardly adopt the functions of a "trade union" in the genrally accepted meaning of the term. It does, however, endeavour to safeguard their general welfare, by aiming at high ideals, encouraging the highest training, organising the competent for the good of the community, and supporting the profession in all public affairs affecting its interests."

There is nothing in the above which indicates that the author is averse to the idea of a union among professional men, but rather the contrary. Although he says in the preface to his book that his views are not necessarily to be read as bearing the authority of the Council of the Institute of Chemistry, the official *Proceedings* of the Institute have in recent times shown that its Council are closely and sympathetically watching all efforts directed to maintaining the status of the chemist.

THE BOARD OF TRADE announce that the Import and Export Licensing Section has been removed from 22, Carlisle Place, S.W.1, and is now installed on the ground floor, Board of Trade, Great George Street, S.W.1. (Tel. Victoria 9800).

Dr. Armstrong and Scientific Research

To the Editor of THE CHEMICAL AGE.

SIR,—My attention has been called to the fact that some of the necessarily brief reports of my inaugural address to the Liverpool Section of the Society of Chemical Industry convey a false impression of the work being done by the Department of Scientific and Industrial Research. This was far from being my intention, and as the question of research is of the utmost importance at the present time, I ask the hospitality of your columns to enlarge on the remarks I made at the meeting in question.

The term research at the present time is used to describe two classes of investigation—those whose sole object is to establish new facts and to evolve new theories, and those whose primary aim is to solve a given problem in such a way as to turn their results to the utility of man.

Broadly speaking, these may be differentiated as scientific and industrial researches, and so far as chemistry is concerned their progress might be expected to be found reported in the *Journals* of the Chemical Society and of the Society of Chemical Industry respectively.

During the war, scientific research, as defined above, had necessarily largely to be sacrificed to utilitarian (war) research. In the reconstruction period much has been made of the necessity of the greater application of science to industry, and the work of the Scientific and Industrial Research Department in establishing and fostering research organisations in the various industries will be of inestimable benefit in years to come. Such work is in the highest degree utilitarian, proper and wise ; and it is a great step forward to have the State coming to the aid of industry in this manner.

The development of utilitarian research must not, however, be allowed to take place at the expense of pure research ; there must be no possibility of any retardation of progress of chemical knowledge on its theoretical side. Many men of eminence in the profession have not been without anxiety on this score, and it may be evidenced that in Germany the absorption of the universities in industrial research during the last decade has not been without adverse effect on the quality of the scientific work.

The Department of Scientific and Industrial Research fully recognises the urgent necessity for purely scientific research. Their report for 1918-19 indicates that not only have considerable sums been granted to technical societies to enable them to carry out investigations in relation to fundamental questions falling within their purview, but also that a large sum has been distributed for the purpose of enabling qualified research workers to undertake or continue their investigations in pure science and of assisting suitable students to obtain training in the methods of purely scientific research, the selection being made on personal recommendation of the responsible professor.

The Department very properly recognises that while it is possible for the State to encourage research in pure science, it is dangerous and even fatal to attempt to organise it. The worker to whom a grant is made is assumed to be devoting himself to the pursuit of knowledge for its own sake, and applications for grants which have an industrial bearing are not made as a rule unless an equal contribution is made by some body representing industry.

It will be apparent, therefore, that the Department is playing an important part in encouraging without interfering in pure research work, and that it is fully alive to the danger which might arise from its neglect, to which I referred in my address.—Yours, &c.,

Warrington, January 30. E. F. ARMSTRONG.

Recent Wills

Mr. A. W. Graham, of Sheffield, chemist.....	£5,682
Mr. J. J. Giles, of Folkestone, for many years in business as a chemist and druggist. (Net personalty £10,631)	£13,690
Mr. M. Robson, of Northumberland, retired chemist.....	£9,206
Mr. J. Gregg, of Leeds, glass bottle manufacturer, of Knottingley	£4,277
Mr. E. Elias, of Kensington, Chairman of the British Oxygen Co., Ltd. (Net personalty £37,615	£38,704
Mr. A. W. Graham, of Sheffield, chemist and druggist. (Net personalty £3,017)	£5,682
Mr. P. W. Davis, chairman of Parke's Drugs Stores, Ltd.	£49,718

The Present Position of German Chemical Industry

Impressions of a British Chemical Manufacturer

THE following extremely interesting statement on the present condition of the German chemical industry is based on observations made by a representative of one of the leading British chemical houses during a visit to Germany. Our informant, who was in Cologne when Peace was signed, made an extensive tour, visiting the principal centres of German chemical industry, and as he has only just returned to England his impressions supply a clear and informing picture of the economic condition of Germany as it actually is to-day.

"My general impression of Germany to-day," he told a representative of THE CHEMICAL AGE, "is that we do not need to fear German competition, at least for several years to come. The *morale* of the German people seems to have gone. The whole nation is suffering from a sense of collapse, and that general condition is fully reflected in the chemical industry of the country.

Germany's Economic Troubles

"Germany is the victim to-day of a number of unfavourable circumstances which combine to make her position for the moment almost hopeless. First among her economic troubles I should place the very serious lack of fuel. While at Coblenz I obtained some quite startling figures which show that the present production of coal is about 50 per cent. of the pre-war output of 191,000,000 tons. This is caused by the loss of the Saar-Lorraine and Silesian coal, and the declining output due to shorter working hours. Out of this quantity they have to supply the French with 30 million tons, another 12 millions are wanted for the railways, and then there are the various essential undertakings. The result is that Germany has only apparently about 20 million tons a year to divide up among her own industries, which are all rationed to 30 per cent. of their pre-war consumption of fuel. As a matter of fact, however, the allowance works out at more like 15 per cent., on account of transport and other difficulties. The effect of this on industry may be judged from a message I have received since my return. The head of a well-known German chemical house wires:—

> For want of coals my fabrication stops within fourteen days. Therefore cannot note your order.

You may take it that that case is fairly typical of the general condition of things. Personally I do not see how the fuel position—which is the basic trouble—is going to improve; it is one of the results of the Peace Treaty. The trade of Germany, like that of England, is based on what may be called a coal civilisation, and if, as is the case to-day, there is not enough coal to go round, it is easy to see what must be the result.

"The second unfavourable condition is the state of labour. At present such miners as are working are working an eight hours' day. Now they are demanding a six hours' day, and they will get it. That will mean putting down production to a still lower point, and further diminishing the supply of a basic commodity, the present scarcity of which is having a paralysing influence on trade.

"The third unfavourable condition is the present rate of exchange, which may be described as the finishing touch. Take a case that came within my own experience. A certain basic product was offered to a German firm at the same price it is sold to British firms, yet the effect of the unfavourable rate of exchange would be that the German firm would have to pay more than twelve times the price the British firm pays for it. We are apt to credit the German people with wonderful commercial qualities, but really it is too much to expect them to make headway against such a combination of troubles.

German Chemical Industry

"What I have said applies in a general way to German industry as a whole. Taking the chemical industry of Germany, I visited a number of large works, and found them working intermittently, some about two days a week. Others, who had succeeded in getting American coal in, were doing rather better, but for that they had to pay £9 a ton. I see no foundation at all for the fear that they are going to swamp our markets with surplus stocks. The indications are all the other way. It is true that at the finish of the war certain stocks had accumulated, and German firms went on manufacturing immediately the war was over because they had a certain amount of raw materials. These are finished now, production has fallen to a very low ebb, and prices are everywhere soaring up—much worse than in this country.

"In addition to this there is a great deal of trouble beneath the surface. Germany is divided into parties, each warring internally against the other, and that, of course, is fatal to rapid trade recovery. On every side one hears complaints of the lack of facilities for transport, due to shortage of coal, waggons, labour and so on. I can testify from my own experiences to the very bad condition of transport in Germany, which is far worse than anything we have to complain of in this country.

A Final Impression

"To sum up my impressions of the economic condition of Germany generally, and of the German chemical industry in particular, I have come back to England very much bucked up. I am convinced that we have nothing to fear in the way of cheap competition for several years to come. The *morale* of the people is gone; production is paralysed by want of coal and want of raw materials; transport is very bad; the exchange is heavily against them. When you take all these factors into consideration it is impossible to see how Germany can regain her place as a great trading nation for a long time to come, however resolutely the people may try to pull themselves together.

"My opinion on these points does not stand alone. I met another English representative in my travels who had been visiting Hamburg and Berlin, and we carefully compared notes of our impressions. We found that quite independently of each other we had arrived at practically the same conclusions. Germany for the moment is down and out, to put it plainly, and the chemical industry of this country has an unprecedented opportunity, if it decides to take advantage of it. That is really the moral of the whole situation; we have an unlimited future before us, and it depends on ourselves whether the opportunity will be taken advantage of or not.

"In one sense the economic collapse of Germany is a rather serious matter for this country. If economically Germany goes down, other European nations may follow, and we shall undoubtedly feel the effect. We have, therefore, to think not so much of the bogey of cheap German competition, which for some years to come may be put out of the question, as of the danger of a too complete collapse, which may re-act seriously on this country. The best thing for the immediate future would be to help Germany—up to a certain point, at any rate—towards a moderate recovery. I do not, of course, put this on moral grounds; I am thinking of the matter from the purely commercial and economic point of view. We have nothing to fear from German competition, but we may have something to fear from a German economic break-up; and in my opinion we shall best be safeguarding ourselves by helping to save Germany from that final catastrophe."

Colloidal Clay in Soapmaking

To the Editor of THE CHEMICAL AGE

SIR,—In reply to the letters on this subject appearing in your issues of January 24 and 31 respectively, I beg to make the following observations :—

It is well known that "China clay" has been used as a filler for soap for at least the last hundred years, but it should be noted that such clay contains from 25 to 50 per cent. of matter, such as sand, quartz, mica, &c., which is of a non-colloidal nature and which, moreover, acts physically in a different manner from colloidal matter. The clay, which forms the subject matter of my article in your issue of January 17, is absolutely free from all such non-colloidal substances and is, owing to its method of preparation, of a highly colloidal nature; the physical properties of this clay are quite different from those of ordinary "China clay" and it is due to these properties, which resemble those of soap, that it is able to be incorporated with soap to the great advantage of the latter.

Mr. Richardson's description of the "purifying action" of soap is obviously at fault. An "insoluble acid salt" would not lower the surface tension of a liquid and produce lather, nor would it increase the surface concentration; it would resemble the metallic soaps which are insoluble in water and do not produce lather. Hot solutions of colloidal clay soap form jellies when cooled without any separation of the colloidal clay, thus resembling true soaps. The above remarks also apply to Mr. Pearson's letter.

With regard to the claim made by the Osmosis Co., Ltd., I can only say that the colloidal clay I speak of is manufactured by a process covered by patents in this and other countries, and therefore must be novel. Moreover, the German invention worked by the Osmosis Co., Ltd., involves the use of "machinery," whereas the colloidal clay referred to in my article is a British invention made by a patented process involving the use of no "machinery," costs less, and has other advantages.

Finally, I should like to emphasise the fact that the physico-chemical properties of our colloidal clay conform to the laws of colloidal chemistry.—Yours, &c.,

The Polytechnic, Regent Street, W.1. FRANK E. WESTON.

February 3.

Oxygen Prices

To the Editor of THE CHEMICAL AGE

SIR,—I am pleased to see that, in a timely and excellent article under the above heading in your last issue of THE CHEMICAL AGE, you draw attention to some of the obviously inaccurate statements in connection with oxygen which appear in the Report of the Nitrogen Products Committee.

These statements may be taken to reflect upon the company which I represent, and as they are calculated to mislead many people, I shall esteem it a favour if you will afford me space to supplement your own observations on the matter with actual facts and figures. The inaccurate statements appear on pages 57 and 58 of the Report, and I will deal with them seriatim :—

1. The Report says that "it appears from information at the disposal of the Committee that the recovery and utilisation of by-product oxygen from nitrogen plants has been checked by restrictive clauses in trade agreements."

There are not, as yet, any nitrogen plants installed in this country, and the only order for such a plant was entrusted to us. It consisted of three large units of the liquid air type, destined for the Committee's unfortunate adventure at Billingham. In the contract there is no mention of any restriction on the use of the oxygen residual. None was ever suggested or contemplated by us. Even a royalty, to which we might have been legally entitled, was not asked for, and the contract for the plant was accepted on a basis of 10 per cent. profit on cost, a profit which we need hardly say is never likely to be realised.

2. The Report states that "the oxygen and liquid air industries in this country cannot be said to have enjoyed a free and unrestricted development on a competitive basis, and the prices hitherto have not been conducive to their employment to the fullest extent."

This company, established 34 years ago, was the first successful commercial enterprise in oxygen, and may justly claim to have founded the world's present industry in that gas. Competition has frequently been experienced by the company in the course of its development, and will, no doubt, be experienced again. Whether that will lead to a freer and less restricted development than hitherto, is a matter for competent consideration in the light of the following facts :—

Oxygen is a supply business analogous to electricity and coal gas. For cheap distribution it has to be produced locally whenever the demand is sufficient to yield an adequate return on the capital involved. This company has steadily pursued that policy. We have to-day oxygen factories in all important industrial centres throughout the country—eleven in operation, and others in hand. I believe that no country is better supplied with oxygen factories than England. I know, at any rate, that in France and the United States of America where competition—that wonderful official panacea for all trouble—prevails to a marked degree, the selling price of oxygen is higher than it is here. Only a few weeks ago I had a visit from an American engineer, prominent in oxygen affairs in the United States. This gentleman admitted that he had arrived in England some weeks earlier with the object of developing an oxygen business. He had personally investigated the situation in all our important industrial centres, and he candidly stated that, as a result, he had found, to his surprise, that the price of oxygen prevailing in this country was so much lower than in America, that he saw no chance of profitably intervening in the business. Before he left he proposed an arrangement under which we should manufacture his company's apparatus for sale in this country. I have reason to believe that this gentleman's visit to England was largely due to the ill-informed reports on the British industry made by a British Government official who visited America during the war.

3. The Report states that "prior to the war the selling price of oxygen to fairly large users, inclusive of the cost of compression into cylinders, of hire of the latter, and of freight, was of the order of 1d. per cubic foot, or, say, £4 per 1,000 cubic feet."

It is to be hoped that this statement is not a fair specimen of the general degree of accuracy throughout the Report. Prior to the war the average selling price of oxygen in this country was considerably less than half the figure quoted above. This average includes not only industrial supplies in large quantities, but also the gas supplied in small cylinders for medical and entertainment purposes. No charge is made for the hire of cylinders for periods varying from a fortnight to a month, but afterwards a small rent charge is made in order to prevent their unreasonable detention. The average cost of transport is only a few shillings per 1,000 cubic feet.

For the year ended March 31, 1919 (the last audited record), the average increase on pre-war figures in the cost of producing, compressing and handling 1,000 cubic feet of oxygen was 8s. 6d., whilst the average increase in the sellling price was less than half that amount. I think even Government officials must admit that there is not much evidence of profiteering in these facts.

4. The Report states that "attempts have been made in this country by lampmakers (electric) to induce the liquid air industry to take up the commercial manufacture of argon, but so far without success."

There is not a vestige of truth in this statement. This company has expended many thousands of pounds in connection with the production of argon. Prior to the war we had conducted considerable experimental work, and an argon-producing plant was in hand when war broke out. Owing partly to war pressure, and the paramount necessity for giving precedence to oxygen supplies, but owing even more to the absence of reasonable assistance from the Government in the matter of labour and material, our first plant was only started shortly after the armistice. It has been in operation, as required, ever since, and a second plant is now being erected in another works. Our difficulty, however, is to find a market for the gas.

I may add that, in addition to the above extracts, there are further statements in this report relating to oxygen and other gases with which we entirely disagree, but as these are put forward as expressions of opinion rather than fact, I will not trespass on your space with further criticism.

I desire, however, to add in conclusion that there is no shortage of oxygen production in this country. The trouble lies in the distribution of the gas, and this is due entirely to the fact that the manufacture of oxygen cylinders was virtually stopped by the Government during the war. This official action was adopted to enable vast quantities of hydrogen cylinders to be manufactured for airship developments which never materialised. Thousands of these cylinders are now lying unused and deteriorating in air dumps throughout the country, whilst oxygen supplies are being starved, and work of national importance retarded for lack of cylinders. This matter might well be investigated by some competent and independent engineer of recognised authority on behalf of the Government. It would afford this company gratification to have a similar investigation made regarding the oxygen position before, during, and since the war. I venture to predict that it would bring to light a striking example of the harm which can be effected by official interference with a well conducted, highly technical, and responsible industry.—Yours, &c.,

Elverton Street, Westminster, February 2.

K. S. MURRAY, Managing Director, THE BRITISH OXYGEN CO. LTD.

Finsbury College Chemical Society

Students' First Post-war Dinner

ON Friday evening, January 30, at the Abercorn Rooms, the present students of the Finsbury Technical College Chemical Society held their first post-war annual dinner. The president of the Society (Mr. A. J. Hale, F.I.C.) occupied the chair, whilst among those present were Professors G. T. Morgan, D.Sc., F.R.S., W. Eccles, B.Sc., and A. J. Margetson, M.Sc.

The Chairman extended a hearty welcome to the visitors, particularly to Prof. Morgan, the former president of the Society, who had vacated the position at the end of last session to take up the position of professor of chemistry at Birmingham University.

In proposing the toast of the Society, Prof. Margetson referred to the activities during the dark days of the war, and then to the wide range of subjects brought forward at the Society's meetings, with their inevitable benefit to members.

Mr. Mernagh, the honorary secretary, replying, briefly outlined the aspirations of the Society (which are handicapped by lack of funds), and referred to the invaluable work rendered the Society by Prof. Morgan during his all too short term of office.

Prof. Morgan, replying to the toast of "The Visitors," expressed his pleasure at being present at the gathering, trusted that it would be the forerunner of many such reunions, and urged for a highly progressive Society.

Mr. T. H. Norris, F.I.C., affectionately referred to as the "father of the College," gave a very interesting account of the history of the College, and told many amusing anecdotes. Referring with pride to the College as the oldest institution of its kind in the world, he prophesied what the future had in store for it.

The speech of the Dean of the College, Prof. Eccles, was, owing to lack of time, unfortunately curtailed, and was confined to a hopeful outlook on the future. The cordial relationship existing between staff and students was emphasised by Mr. Youll in proposing "The Staff," and the toast was replied to by Dr. H. M. Atkinson.

A feature of the evening was the presence of the three lady members, whose health was proposed by Mr. P. Edgerton, and replied to by Miss Chatworthy. The proceedings concluded with a short musical programme, the artists including Prof. Margetson and Messrs. Price, Fraser, Bolton, Biggs and Thatcher.

Society of Public Analysts

THE annual general meeting of the Society of Public Analysts was held on Wednesday, February 4, at the rooms of the Chemical Society, Burlington House, Piccadilly, London. Dr. S. Rideal presided and delivered his annual address.

The following officers and council were elected for the ensuing term:—

President: Mr. Alfred Smetham.

Past Presidents: Messrs. Leonard Archbutt, Edward J. Bevan, A. Chaston Chapman, Bernard Dyer, Otto Hehner, Samuel Rideal, E. W. Voelcker and J. Augustus Voelcker.

Vice-Presidents: Messrs. W. J. A. Butterfield, G. N. Huntley and G. Rudd Thompson.

Honorary Treasurer: Mr. Edward Hinks.

Acting Honorary Treasurer: Mr. E. W. Voelcker.

Honorary Secretaries: Messrs. P. A. Ellis Richards and E. Richards Bolton.

Other Members of the Council: Messrs. S. W. F. Arnoud, W. Bacon, F. H. Carr, H. D. Colman, G. D. Elsdon, P. J. Fryer, R. Hellon, H. Hurst, C. A. Keane, S. T. Melling, E. W. Monnier Williams and W. Lincoln Sutton.

Sir John Cass Technical Institute

Distribution of Prizes

THE prizes gained by the students of the late Sir John Cass Technica Institute were distributed on Tuesday by Lt.-Col. P. S. Lelean. The Rev. J. F. Marr, Chairman of the Governing Body of the Institute, presided.

Chairman's Review of the Year

THE CHAIRMAN, in opening the proceedings, referred to the work which had been done during the past session at the Institute and the further developments in contemplation. The session, 1918-19, he said, would always be remarkable in the history of the Institute as having been marked in the beginning with the signing of the Armistice, and towards the end by the conclusion of the Treaty of Peace. The preceding years of warfare had overshadowed all educational work with anxiety, and it was with no ordinary sense of deep gratitude and relief that they were able to approach more normal activities, and, above all, to welcome back the great proportion of students who had served their country in the hour of great need.

The number of students during the session 1918-19 was 73 per cent. above that of the previous year. This educational awakening had not been limited to those who gave direct service to the country; a far fuller realisation of the value of education had been borne in upon every portion of the community, stimulated, no doubt, by material considerations, but none the less real in its call for progressive development. This call was particularly marked in the domain of science. The outstanding services rendered by so many branches of experimental science in connection with the war had stimulated a long-delayed appreciation of its national importance and educational value, as well as its contribution towards the advancement of knowledge to the benefit of mankind.

Their numbers were in advance of pre-war figures, and the total of 850 students was making it difficult to carry on the work with satisfactory efficiency. If the Institute was to take a fitting part in the future of the educational work of the London district there was no half-way house. Compared with other countries, typically the United States and Germany, we were behind. In technical education there was need for a broad outlook, and in the Institute the character of future development was receiving the earnest consideration of the Governing Body.

In the present session courses of instruction in glass technology had been initiated. There was no previous provision for instruction of this character in the London area, and it was hoped that this development would be of help to an industry which had been too closely associated with foreign manufacture.

Referring to the actual work of the Institute during the past session, the Chairman said that the prosecution of research had been restricted by the great demands upon the time of the staff for instructional work. Thirteen students were engaged in research during the session, and six papers were published. This brought the total of original investigations issued from the Institute up to 104.

During the war several positions on the staff had to be temporarily filled by part-time teachers, whose assistance was invaluable. Full-time appointments had now been made, however, and he welcomed as full-time staff among others Mr. E. de Barry Barnett, lecturer in organic chemistry; Mr. G. R. D. Hogg, lecturer in mathematics; Mr. R. H. Humphry, lecturer in physics; and Mr. P. C. L. Thorne, assistant lecturer and demonstrator in chemistry. In the Department of Metallurgy Mr. C. O. Bannister resigned his post as part-time head of the Department at the close of last session, but they were able to retain his services as a part-time lecturer. Mr. G. Patchin, lecturer in metallurgy, had been appointed to succeed him as head of the Department.

Amongst the part-time members of the staff they had to regret the resignation of Mr. H. G. Dixon, lecturer of mathematics. The new part-time members included Mr. W. Butcher, demonstrator in metallurgy; Mr. J. D. Cauwood, lecturer in glass technology; Mr. W. A. Newman, lecturer in metallurgy; and Mr. F. Ruddock, demonstrator in fuel analysis.

In conclusion, the Chairman referred to their indebtedness to the Board of Education, the London County Council, the Aldgate Freedom Foundation and the Aldgate and All Hallows Banking Foundation for their help towards the work of the Institute and the equipment of the laboratories and workshops. Their thanks were due also to the Worshipful Company of Goldsmiths, the Worshipful Company of Merchant Taylors, the Directors of the South Metropolitan Gas Co., and Messrs. Whitbread & Co. for their generous grants for the award of prizes. An appeal was made for the provision of £50,000 for the extension of the work of the Institute, and a tribute paid to the late Chairman of the Governing Body, Sir Thomas H. Elliott, Bart., K.C.B., who had resigned on his appointment as British delegate to the International Institute of Agriculture at Rome.

After the distribution of the prizes Lieut.-Colonel Lelean, Professor of Hygiene at the R.A.M. College, who was in charge of the research work in connection with gas warfare, delivered an address on "Applied Science in Gas Warfare," a report of which we are unfortunately obliged to hold over.

"Recent Work on Colloids"

Paper by R. S. Willows, M.A., D.Sc.

A MEETING of the Chemical Section of the Manchester Literary and Philosophical Society was held on Friday, January 30, when a discussion was opened by Dr. R. S. Willows upon "Recent Work on Colloids." Mr. R. H. Clayton presided over a full gathering of members.

Dr. Willows defined "colloidal matter" as being matter in a fine state of sub-division, which consequently possessed a large surface area, although he was quite well aware that this definition would probably not satisfy all textbook purists. In amplification of his statement he explained that if a cube of 1 cm. side is divided into cubes whose sides were one-millionth the total surface is 60 square metres. In illustration of this, Dr. Willows referred to the area of surface exposed by blood corpuscles calculated as being something like 1,700 sq. cm.

Why a Special Study of "Colloids" is Needed

In face of such a simple definition the question would appear to arise why a special study of "colloids" was necessary, and a special technique developed for the purpose. Fortunately the answer could be readily given. With each square centimetre of surface a definite amount of surface energy was known to be associated. For example, if the area of water was increased by 1 sq. cm. it involved the expenditure of 70 ergs of energy. In addition, each surface was supposed to have on it a double layer of electricity—*e.g.*, if a surface divided one medium from the other it was to be supposed there was negative electricity on the one side and positive on the other. He used the word "supposed" advisedly, because, although quite a number of facts could be explained by such a supposition, unless one could state a reason how the double layer came into being, among other matters, the problem did not appear to have passed beyond the realm of supposition. With each square centimetre of surface there was surface energy due to surface tension and certain electrical energy. Matter exposing a very large surface necessarily had associated with it a very large amount of surface energy, the importance of which was that if by any change that surface energy could be reduced then such a change was likely to occur. Hence, it followed that the behaviour, chemical and physical, of colloidal matter might be governed entirely by the possible changes in the surface energy, or, in other words, there might be certain physical changes which took place because they resulted in a definite decrease of surface energy. Therefore, the co-operation of both physical and chemical science was necessary in the conduct of research work.

"Adsorption"

For the purpose of the discussion he was going to assume, broadly, that any changes which occurred were governed by changes in the surface energy. This assumption at once indicated a very important fact. Taking a mixture, for example, of water and alcohol; normally, through diffusion, the alcohol would be distributed equally throughout the whole volume of water, but its presence in the surface area would reduce the surface tension; the result was that, from a well-known physical principle, there would be a tendency for the alcohol to concentrate in the surface. By a departure from uniform distribution throughout the whole mass of water, and by concentration more largely in the surface, the surface energy was thereby reduced to as low a value as was possible under the circumstances. Necessarily, the influence which would oppose this principle was that of osmotic pressure. If, on the other hand, the surface energy was raised there would be a tendency for the surface layers to be less rich in the foreign matter than the bulk of the liquid. The former was termed positive adsorption. When there was a defect in the foreign matter in the surface it was termed negative adsorption.

In further illustration of this point Dr. Willows mentioned an interesting experiment by Professor Bayliss with a mixture of rennet and water, the resulting "froth" being partly due to the decrease in surface energy. Analysis showed that there was more rennet in the froth than there should be according to the proportion in which the rennet was added. By adding saponin the surface tension of the water was lowered, and the froth was depleted of rennet. A further experiment with animal charcoal and common salt was also instanced, in which the resultant solution coming through was more concentrated than at the commencement of the experiment, the surface being poorer in common salt and mainly the liquid taken out. The principle of adsorption was of very great importance, and was applied in quite a number of industrial applications—*i.e.*, the clearing of solutions of beer, sugar, gelatine, &c.—the turbid matter being adsorbed, thus leaving a clear liquid.

Dr. Willows then referred to a more questionable instance, principally on the ground that it had been put forward by certain chemists and mentioned in some books on chemistry. This was in respect to catalytic effects. Assuming two molecules, for instance, hydrogen and chlorine, collided it did not necessarily follow that they combined; but given a suitable catalyst they might be adsorbed on its surface, and so be kept in contact longer, and there was a greater chance of chemical combination. Adsorption was probably one of the preliminaries in some dyeing operations, though it could not be claimed as a complete explanation of dyeing; it was probably doubtful whether any one single theory would cover the whole range of that process. Another point was the taking of bacteria out of town's water by running the water through a sand filter. Bacteria are electrically charged—if placed in an electrical field they were caused to move in a certain direction—and are adsorbed as a result of the surface energy.

A great deal of the work already done in the examination of the principle of adsorption was extremely unsatisfactory, emphasis being placed upon an adsorption equation which was not conclusive. Some people had gone so far as to say, especially in Germany, that if results were obtained which could be represented by the equation that was adsorption, while as a matter of fact it might just as well be a distribution effect according to Nernst's results. A few years ago, Dr. Willows said, he himself discovered salts which, when heated, emitted a large amount of electricity, the curve obtained being quite different, yet of the same algebraic form, to that of adsorption, so that the equation had very little physical basis.

Another drawback that the equation presented was that it did not even express the simple experimental results. In this experience he was borne out by the research work of Dr. Williams, of Edinburgh. The adsorption layer had been shown to be unimolecular in some cases; also it was known that when there was adsorption there was solid solution, and in this connection Dr. Willows cited the experiment by McBain with a piece of carbon entirely freed from gas and subsequently exposed to gas. If only exposed for a short time gas was adsorbed, while, if exposed for a long time, McBain expressed the opinion that there was infiltration of the gas, and supported this theory by experiments which the lecturer described.

Sols and Emulsions

Turning to another branch of the subject, Dr. Willows dealt with sols and emulsions, the former being defined as the suspension of very small solid particles in a suitable liquid, and the latter particles of liquid. The peculiarity of the solutions under consideration was, of course, that the sols did not settle by gravity. There were, he believed, to be seen at the Royal Institution, in London, sols which had been prepared by Faraday in 1857, and showing a good ruby red colour in the manner of gold sols. By transmitting a beam of light through them it was quite noticeable that they were not homogeneous.

Dr. Willows explained that if the light was polarised the shape of the particles could be determined by studying the mathematical theory of polarisation. The present Lord Rayleigh had demonstrated that the Tyndall cone could be obtained by the use of air molecules instead of turbid media. The use of X-rays gave no information whatever respecting the state of aggregation as the effect was purely atomic, although Dr. Ostwald had suggested their use for this purpose.

Crystal Structure

A very interesting result had been obtained quite recently by the Braggs' method of studying crystal structure. It had been found that very fine particles, too fine to be seen by an ordinary microscope, had a very fully developed crystalline structure. For example, gold sols about five millionths of a millimetre in diameter had a developed structure practically the same as bulky gold, so that their internal structure was determined by crystallising forces, and their external form was determined entirely by surface tension forces, the theory showing that although they were not quite spherical they were very nearly so. As sols carried an electric charge they could be precipitated by adding suitable electrolytes.

In this connection Dr. Willows mentioned that the method of expressing the results was often misleading. Assuming a series of particles which were negatively charged, such as a gold sol, by adding common salt they were precipitated because, apparently, their charge was neutralised by the sodium ion. By taking out the positive charge from the solution there would necessarily be left an excess of negative charge. What really happened was that the sodium ion was eliminated as well as something else, and in this case it took out the HO or Cl ion along with it. Apparently what happened was that the sodium ion went to the surface and the HO or Cl ion followed in very close company. It had usually been supposed that the particles, in order to be completely precipitated, had to have their charge fully destroyed by adsorption from a solution or by a supply of ions from an outside current. Experiments by Ellis showed that this was not by any means the invariable rule.

Dr. Willows briefly referred to the stability of the particles which were always moving about, somewhat after the manner of a swarm of bees. It was usually supposed that if they were negatively charged they repelled one another, and could not possibly settle down into the bottom of the vessel. Smoluchowski had calculated that the repulsion between the charges (if nothing else happened) was sufficient not only to keep the particles from settling, but to blow the whole experiment into smithereens. There was in reality something else present. There was a double layer, and the electric field existed only in that double layer.

Another theory was that the electrolyte altered the surface energy of the sol, it being known that if the electrical charge was decreased the surface tension was increased. Therefore, Bedig argued, when there were two particles near each other which were absolutely

neutral they possessed the highest surface tension possible, and would attract each other. But this did not follow in the least. It did not matter how much the surface energy was increased there would not necessarily be attraction developed between them. It was true they would stick together if they came into collision, but it did not follow there would be the necessary forces developed to bring them into collision. Surface tension had no influence at all.

Another matter which had been brought into prominence during the war period, by the Polish physicist Smoluchowski, was the theory of precipitation of sols. As the precipitation proceeded aggregates were formed consisting of one, two or more primary particles. Smoluchowski supposed that if their Brownian motion brought two particles near enough together the double layer was broken and attraction and coagulation ensued; this would occur more readily when the layer was partially destroyed by electrolytes. He succeeded in calculating the number of primary, secondary and tertiary particles at any time, and Zsigmoudy and his pupils had verified his results by actual counts. The explanation was not complete, as Smoluchowski did not specify what were the forces causing attraction, but it indicated that inquiries were proceeding in the right direction.

Surface Tension and Constitution

Dealing with the relationship between surface tension and constitution, Dr. Willows said that this question had been approached from three independent directions—by Sir Joseph Thomson from an entirely physical standpoint, and by Harkins and Langmuir, in America, from other standpoints. They assumed that in many complex molecules there were certain groups which were polarised. To take the case of an OH group, the O and the H, being joined together, the O might be neutral and the H might be neutral. On the other hand, the H might have lost an electron, which it was very liable to do. It would, therefore, have a positive charge, and there would also be present a negative charge on the O. So there would be a field developed, and, according to Thomson, it was that field which would account for all surface tension effects, all adsorption effects, and also for the fact that sols had a charge initially because the charges attracted ions from outside.

Langmuir and Harkins pursued their inquiries mainly from the chemical side, and some of Langmuir's experiments were particularly striking. For instance, if a layer of oil on water was produced it was found that if a very small quantity of oil was put on the layer was only one molecule thick; also that if a thin layer of oil was placed upon the water, and compression was applied so that the molecules were close together, the molecules must be standing on their heads, so to speak, with the active groups in the water, and their tails towards the vapour on the top. Thus, by measuring the thickness of the layer one obtained the length of the molecule, and by ascertaining how many molecules were present the diameter of the molecule could be determined. Langmuir had found with certain of the long-chain carbon compounds, such as stearic acid, that the length was six times the diameter. This was a very interesting line of research.

Lubrication

The theory of "Lubrication" was a standing evergreen with most scientific societies. How was it that oil did lubricate? Why did a saturated hydrocarbon behave less efficiently as a lubricant than an unsaturated one, and why was a vegetable or animal oil even more efficient? In the lecturer's view it was simply because a necessary condition for lubrication was that there must be a strong attraction between the lubricant and the surface to be lubricated. If there was a strong attraction between the molecules and the metal parts to be lubricated, due to polarised molecules, the mechanism was provided for the lubricant to adhere to the lubricated surfaces.

Separation of Minerals by Frothing

A subject which had recently been before the consideration of the Institution of Mining and Metallurgy was the separation of minerals by frothing, and Dr. Willows instanced the case of zinc sulphide. The ore was divided into a very fine powder, and was then poured into a tank, there being about one ton of ore to about five tons of water. A quantity of cresol was added, and the whole stirred. A certain amount of acid was also added. Air was blown through, and at the top a very strong froth was formed, which contained, fortunately, all the zinc-containing particles, whereas the quartz fell to the bottom.

Conclusions

From the foregoing remarks Dr. Willows hoped it would be clear that the question of "Colloids" was neither entirely a province of physics nor of chemistry, but that it impinged upon both. Co-operation must be looked for between the two sciences as one of the most hopeful lines of advance.

The Manchester Chair of Colloids

A further point he desired to make was that at the present time an effort was being made to secure that co-operation by the establishment of a Chair of Colloids at the Manchester University. A chair of colloids was an exceedingly important need, not only for science, but also for industry, and there was nowhere where it could be more safely housed than at the Manchester University, where both the professors of chemistry and of physics were enthusiastic for its establishment. He ventured to express the conviction that the Chemical Section of the Manchester Literary and Philosophical Society would do all in its power to bring such a chair into being.

General Discussion

Dr. ORMANDY dealt with many theoretical applications of the subject under consideration, and drew the attention of the meeting to the great developments that had taken place in Germany over a number of years. He pointed out that the Electro-Osmose Actien Gesellschaft had spent £25,000 per annum for a considerable number of years in salaries alone upon research work in connection with colloidal chemistry. This was a sum per annum equal to the capital amount which was now asked for with a view to establishing a Chair of Colloids at the Manchester University. He further referred to the tremendous developments which had taken place in the purification of china clay and fire clays, and related how tanning was now being carried out on a commercial scale in hours instead of months, and also described how electricosmetic processes were applied to the drying of peat, the dyeing of leather, and the preparation of high-grade serums for medical purposes, and generally stated that unless this country began to take more active steps in the future than it had in the past, in the application of science to colloidal matter, Germany would inevitably regain that pre-eminence which she undoubtedly held prior to the war in this and most other applications of pure science to technology.

Dr. FERGUSON, speaking upon points of pure science, said that it was a matter of primary importance there should be more extended knowledge of interfacial tensions and composition as existing between liquids, air and gas. The figures mainly available, based as they were upon capillary tube measurements, were open to grave criticism. The "falling drop" method of measurement was also unsatisfactory. Experiments in the elucidation of surface tension problems were now being made by forming a bubble, or drop—either would do—for measuring air-liquid surface tension, and projecting the bubble, or drop, on to a screen, taking a highly magnified photograph of it, and calculating the dimensions therefrom. By this means it was possible, by different methods, to arrive at the value of the surface tension.

Dr. COWARD said that it had been emphasised that a colloid was matter which was so finely divided that the surface took a very prominent part in determining its chemical and physical behaviour. If that was so, how was it that a still smaller particle, the molecule, did not exhibit an overwhelming influence of surface? His own opinion was that it did, and that the characteristic forces of the atom—namely, valency—were indentical with the surface forces of colloids. This was the argument that Langmuir had recently advanced—that the colloid owed its properties to free valency bonds. Sometimes he spoke of primary valencies and sometimes of secondary valencies. According to him, the forces were very familiar to the chemist. J. J. Thomson, being a physicist, called these forces electrical doublets. Working back to the atom, the valency forces, according to Thomson, would be entirely electrical in origin. There appeared to be quite the making of a very pretty argument if chemists in speaking of these forces as valencies and physicists speaking of them as electrical doublets were to quarrel about nomenclature. What the forces really were, and what they were doing, perhaps would remain a matter of speculation for a long time to come.

Professor LAPWORTH spoke warmly in favour of a "Chair of Colloids" at the Manchester University.

Dr. Willows' Reply

Dr. WILLOWS, in reply, said that Dr. Ormandy had given them some information of the amount spent by the Germans on research work with regard to "Colloids," which ought to make them all do some very hard thinking. He, personally, would like to give one other figure to show the English side of the question. £25,000 was, approximately, the figure that the artisans of a certain English city preferred to lose in wages in order that they might attend a certain football match. He could not, of course, reply to a great many of Dr. Ormandy's remarks because as yet there was not sufficient data to enable him to do so. He quite readily admitted that one had to make certain assumptions at present, and it was advisable to regard a theory as a policy and not as a creed. He believed that a great deal better work would have been done if, instead of confining attention to small particles, inquiry had been made as to suspen soids. He certainly had doubts concerning the double layer, although with two solids, say, zinc and copper in contact, there was undoubtedly a difference of potential developed, and therefore a transfer of electricity from one to the other. Other evidence was the effect observable in the capillary electrometer. He was quite in agreement with Dr. Ferguson's remarks as to the value of the surface tension being in doubt. The term "valency" meant very little to him, while the employment of the term "field" did imply a certain mechanism that could be pictured. At a lecture given by the President of the Chemical Society some years ago, Sir William Ramsay's main argument was that a chemical combination was due to the transfer of electrons from one substance to another. There was only one other remark to make, and that was that it was not a necessary consequence that because two particles were in contact they would combine. It might be necessary to have a "key and lock" arrangement, or, in other words, an orientation in a particular way.

The " Germ " Process of Lubrication

Paper and Discussion at the London Section

AT the meeting of the London Section of the Society of Chemical Industry, on Monday, February 2, a Paper on the " Theory and Application of the Germ Process of Lubrication " by Messrs. H. M. Wells and James E. Southcombe was read.

The Theory of the Process

The Paper put forward considerations with regard to the theory and practice of lubrication which were the result of many years' experience of the problems of lubrication oils and lubrication, studied from the physical and physico-chemical standpoint assisted by that daily contact with the lubrication of all types of machinery and prime movers such as the lubrication oil manufacturer has the unique opportunity of obtaining. The object of the authors' work was to elucidate the reason for the obviously superior lubricating efficiency of fatty glycerides over " straight " mineral oils in a large number of practical cases which had come under notice. As a corollary to this, it was necessary to review the physical principles upon which lubrication depends, and to seek an explanation of the peculiar property which has been called " oiliness."

The first part of the Paper dealt at considerable length with the present position of our knowledge of lubricants and lubrication, and various views as to the causes of " oiliness " were quoted. The authors laid it down that liquids which do not " wet " solid surfaces cannot be described as lubricants, and that only those liquids which " wet " a solid surface possess lubricating power in the generally accepted sense. After a detailed description of the authors' own work, in which a method of experiment by the drop pipette was adopted, the following conclusions were claimed as demonstrable :—

1. Capillary effects, hitherto ignored in lubrication, play a fundamental part.

2. That the presence of fatty acids in an oil lowers the surface tension of the said oil against water.

3. That a neutral glyceride possesses a similar tension to a neutral mineral oil.

4. That the addition of a relatively minute amount of a fatty acid to a neutral mineral oil reduces the tension to that of a commercial animal or vegetable oil or compounded lubricating oil.

The authors are satisfied that the physical rationale of the property of oiliness has been demonstrated, and in calling attention to the fact that Langmuir's view is that oiliness depends on the chemical forces called into play between the active part of the oil molecule and the solid surface of the bearing, they emphasise that they have confined themselves to a statement of the physico-chemical experiments which they themselves have made and to the development of the physical theory.

The main point of the Paper turned upon the practical results of the addition of a small percentage of fatty acids to mineral oils, and in this connection the authors' thanks were expressed to Mr. L. Archbutt for the frictional tests he has made which he recently communicated to the Physical Society. Archbutt's results in this case showed that 1 per cent. of free fatty acids lowers the friction coefficient as much as does 60 per cent. of pure rape oil. These results have been confirmed by the authors on an independent machine of the Thurston type, and the Paper contained tables of results. It is pointed out that this principle of making lubricating oils by adding to mineral oils small quantities of fatty acids or substances which lower the interfacial tension has been accepted by the Patent Offices in all civilised countries. A word was added with regard to the possibilities of corrosion. All compounded oils which have been in daily use for years contain notable amounts of free fatty acidity, yet active corrosion was rarely heard of. In the authors' case only minute amounts of fatty acids are added, and the quantity is strictly limited and controllable. But where fatty glycerides are employed the amount of acidity which can form is potentially very large, because hydrolysis is constantly going on giving rise to the production of free acids.

Application of the Authors' Process

The second part of the Paper gave particulars of the application of the authors' process, which is termed the " Germ " process. It is claimed that the Germ process oils have entirely displaced the compound oils for horizontal and vertical gas engines, which for the most part consisted of the addition of coconut oil to a mineral oil. Similarly with regard to oil engines, and incidentally it is pointed out that the quality of the mineral oil or oils to which the fatty acids are added is a very important factor, owing to the enormous variation in the composition and properties. The manner of application of the Germ process to oils for steam turbines, crank cases of vertical steam, gas and oil engines was discussed, and in connection with the standard specification for marine bearing oil for one of our semi-Government Departments, which provides for a compound of about 20 per cent. of fatty oil, the " Germ " process marine oil engine has been doing for about 18 months the same work for which this 20 per cent. compound oil was previously considered essential.

The authors' specification was filed on February 5, 1918, but within a few days the Engineer-in-Chief's Department of the Admiralty spotted it, and prohibited publication or communication. The Admiralty immediately decided to try oils made on this process. Trials were made over a period of many months on about 15 ships of the mercantile marine, including a fair proportion of liners, and the results were quite satisfactory. " Without using any fatty oil, but simply mineral oils and a small proportion of " germ " contents, marine engine oils were provided in quantity, completely filling the role of the heaviest engine oil compounded with up to 20 per cent. thickened rape oil, to the satisfaction of the Admiralty and those responsible for the ships. One thing the authors hoped for as the result of their work was a little more faith in the oil chemist and the " oilman," and they predict that most of the old formulæ of compounded oils and compounding will shortly become obsolete and will be scrapped. The authors claimed to have shown that fatty compounded oils are unnecessary for many purposes of lubrication, and that fatty acids can entirely and completely displace fatty oils for these purposes. They are not only cheaper per gallon, but very much smaller percentages are required. It is estimated that many hundred thousand pounds now wasted yearly can be economised by the use of fatty acids on the lines laid down.

Discussion

Mr. L. ARCHBUTT said this process was brought to his notice some time ago in connection with his official work, and as it seemed worthy of investigation he decided to make some friction tests in the laboratory. He used a Thurston machine, but as this, used in the manner in which it was usually put to work, would not have measured anything but the fluid or viscous friction, he ran the machine at a very low speed and with a good load on the bearings, and so secured a certain amount of contact friction, which was necessary, and in the tests he made, the speed was 7 ft. per minute, and the load about 270 lb. per square inch. The experiments were made with some fatty acids from rape oil, which he specially prepared, and the mineral oil used was a paraffin-base oil of practically the same viscosity as rape oil at 60°F. to 65°F., which was the temperature in all the tests. In all cases the machine was run with the straight mineral oil until the friction became steady, and then, without stopping the machine, the oil was changed to a mixture containing fatty acids in the percentages given in the tables below, a final test then being made with the straight mineral oil again as a check.

The result of the first series of tests was as follows :—

	Mineral oil.	Rape oil fatty acids.	Friction coefficient.
1.	100·0 ...	Nil. ...	0·0066
2.	99·5 ...	0·5 ...	0·0049
3.	99·0 ...	1·0 ...	0·0045
4.	98·0 ...	2·0 ...	0·0042
5.	100·0 ...	Nil. ...	0·0066

The next series of tests was upon the effect of adding neutral rape oil to the mineral oil, and the results were as follows :—

It would here be seen that nearly 80 per cent. of neutral rape oil was required to reduce the friction as low as did 2 per cent. of rape oil fatty acids :—

	Mineral oil.	Neutral rape oil.	Friction coefficient.
1.	100 ...	Nil. ...	0·0066
2.	90 ...	10 ...	0·0065
3.	80 ...	20 ...	0·0062
4.	60 ...	40 ...	0·0053
5.	40 ...	60 ...	0·0047
6.	20 ...	80 ...	0·0041
7.	Nil. ...	100 ...	0·0043
8.	100 ...	Nil. ...	0·0062

Finally, another series of tests were made comparing mineral oil, commercial rape oil and neutral rape oil :—

	Oil.	Friction coefficient.
1.	Mineral oil	0·0078
2.	Neutral rape oil	0·0050
3.	Acid rape (2·4 per cent. F.A.)	0·0045
4.	Mineral oil	0·0078

These results appeared to prove that the contention of the authors as to the friction reducing value of free fatty acid was perfectly sound, but he could not agree that the lowering of the interfacial tension between oil and water, although very interesting and important, was a sufficient explanation of oiliness. He was more inclined to agree with the views that had been expressed by other workers that oiliness was a chemical property, and he referred to the work of Langmuir, Harkins and Hardy in this connection. All recent work pointed to the fact that it was the chemically reactive and unsaturated constituents which promoted oiliness, and that they did so by forming new composite surface films on the surfaces lubricated, with lower surface energy and opposing less resistance to shear, and the great activity of free fatty acids was quite in accordance with this theory.

Dr. ARNOLD PHILIP fully agreed with Mr. Archbutt in thinking that the authors had not shown what oiliness really was. It could not be due merely to the wetting of the surface because glycerine had a very similar viscosity to oil, and would certainly wet ordinary bearing surfaces, but as a lubricant, of course, it was quite valueless. General practice had shown that the admixture of small amounts of

fatty oils with mineral oils gave a distinctly better lubricant for many commercial purposes, although he was not sure that the reason for that was generally known or published. An instance of that came under his notice in which a clear and pure mineral oil resulted in a greater friction than when sperm oil was used. He had also heard of a manufacturer who always used a large percentage of fatty acids when making compounded mineral and fatty oils. Consequently, when the authors' process came before him it at once appeared on the face of it to be a good thing, and he strongly advised that the question should be gone into thoroughly. The novel thing which the authors had done was to use a fatty acid as distinct from a fatty oil, which meant economy in the use of fatty oils. He hoped, however, that the word "germ" in connection with it would be abandoned, as it had no reference to the process whatever. The authors had effected an extremely useful advance in lubricating work, and there was no advantage in wrapping the process up in—he would not say deceptive—but at any rate misleading titles.

The HON. SECRETARY then read a letter from Prof. F. G. Donnan, who said that a great deal of matter which had apparently been brought forward in the Paper as novel had already been elucidated by himself.

Dr. W. R. ORMANDY said he was astonished at the authors' lapse from real scientific insight in claiming that these experiments were sufficient upon which to base a theory. It seemed quite impossible to draw the conclusion that interfacial tension was the basis of "oiliness," because certain experiments with an oil containing free fatty acids gave a certain result as against water, which was more or less comparable with the results obtained in practice on a metallic surface. Mr. Archbutt's figures, he contended, confirmed Langmuir's theory, if there was anything in that theory, because it was seen that after an addition of 0·5 of free fatty acids anything further produced a comparatively small effect. Langmuir had shown in his theory that once there was a layer of free fatty acid oil molecules of one molecule thick upon the surface, any addition produced a very small effect. Experiments which he had carried out with china clay also proved the accuracy of Langmuir's theory.

Professor J. S. S. BRAME said that experiments which had been described at the Physical Society by Mr. Archbutt, Mr. Deeley and Mr. Hardie showed that in the case of fatty acid mixtures, and in the case of alcohols of increasing molecular weight, and also on many paraffins there was a progressive decrease in static friction with increased molecular weight. That seemed to have an important bearing on this question now being discussed. He would like the authors to say whether they found that on taking the saturated fatty acids, starting at fairly low molecular weight and working up to those of fairly high molecular weight, there was any relationship between the effect of these acids from the molecular weight point of view and their influence on this particular problem. Again, did they find a saturated fatty acid of approximately the same molecular weight as the unsaturated fatty acid, and had it the same effect? Some of the figures given by the authors and also those given by Mr. Archbutt suggested that there was not much difference between the action of a saturated fatty acid and an unsaturated fatty acid. Again, was there any connection between the action of the fatty acids with different types of hydrocarbon oils when there was considerable variation in the amount of the unsaturated hydro carbon present? Further, could the authors give any information as to the influence of a good amount of fatty acid upon a hydro-carbon oil like a shale oil comparatively with a distillate oil like a lubricating oil? He agreed that the authors had not carried the matter very much further in arriving at a solution of what oiliness really meant.

Mr. DRUMMOND asked the authors for an opinion why it was that castor oil caused corrosion of steel ball bearings.

Mr. SOUTHCOMBE, in reply, to the discussion, said he had not attempted to set up any theory, but had merely stated some plain facts which had come to his notice. At the same time he did not consider that even Langmuir's theory had been definitely proved. Whilst agreeing with Professor Donnan that the Paper was based upon work done by him and his collaborators, he thoroughly disagreed that Professor Donnan had elucidated the matter from the same point of view. Professor Donnan had set out to show that as he ascended the series of fatty acids starting from acetic and going right up to stearic, the surface tension became enormously lower. In doing this Prof. Donnan had been determining the adsorption on surfaces of fatty acids in oils in alkali solution. That was all he was out to prove, but he did not prove, because he was not out to prove, that there was not a diminution of interfacial tension against water. The authors claimed to have shown that the drop pipette could be used in the examination of oils, and had been able to show that the coefficient of friction could be reduced, which was what he and Mr. Wells were after. He did not think the question of aqueous solutions concerned the Paper, nor did the question raised with regard to corrosion set up by castor oil. Replying to Professor Brame, he said the authors had not done anything to indicate the variation of the frictional coefficient with the molecular weight of the acid, but they had carried out a series of experiments with regard to emulsification and de-emulsification, which would shortly be published. Neither had the authors carried out any work with regard to the extent to which degrees of saturation affected the matter.

Drying Machinery

Paper by Eustace A. Alliott, B.Sc., A.M.I.Mech.E.

AN interesting lecture was delivered by Mr. Eustace Alliott (Manlove & Alliott), at the Manchester Municipal College of Technology, on Tuesday, January 27. There was a large attendance.

Mr. Alliott stated that efficient drying depended upon the facilities given for the necessary heat to reach the material in order to give the evaporation and also for the vapour to get away. Driers might, therefore, be primarily classified as those in which the material was spread out by hand in thin layers, and those in which the material was mechanically spread or agitated. They might also be grouped according to whether they treated the product in batches or continuously, and might be sub-divided still further according to the method of heating—whether by hot air or other vapour; direct steam, hot water or other liquid; furnace gases or direct fire heat. There was also a final classification according to whether the plant worked under atmospheric pressure or under vacuum.

Selecting a Drier

In selecting a drier, the following points, among others, must be given careful consideration:—

1. What was the total quantity of material to be handled, both as regarded weight and bulk?
2. What was the total amount of moisture contained in the material and the final degree of dryness desired?
3. What was the nature of the wet material, *i.e.*, its qualities as regarded shape, solidity, tendency to stick to hot surfaces or bind up on agitators, and what temperature it would stand?
4. What were the physical and other properties required in the dry product as regarded form, appearance and texture?
5. What space was available for the installation, and what was its relation to other plant required?
6. What sources of heat and power were available and the local cost thereof?
7. Type and cost of local labour.
8. Facilities for replacements and repairs, especially if the installation was intended for export abroad or for a district out of touch with engineering facilities.
9. What funds were available and what were the probabilities of the market for the product?

Hot Air Drying

Mr. Alliott first dealt with a number of installations in which the material was spread out by hand and dried by means of a current of air. In such plants effective drying depended primarily upon the material being spread out in thin open layers. It must be evenly spread, otherwise some parts would take longer to dry than others and output would be held back. Cost of labour would be expensive. Such driers were used when the materials were unsuited by their shape or nature to mechanical agitation; when they required to be dried comparatively slowly and under very special conditions as to temperature and moisture of the drying air; when the substances might take fire or explode if handled mechanically or at a high temperature, such as picric acid; in the case of corrosive substances which would destroy mechanical driers unless made of very costly material, but which could, quite readily, be dealt with in glass, enamel or even wooden trays in a stationary hot air drier.

Many substances, he said, such as certain colours, fruit, vegetables and confectionery, &c., were also treated by hot air in chambers arranged with shelves. Methods devised for circulating the air from one chamber to another in order to get the greatest economy of heat were then described.

The Drying Properties of Air

Before considering mechanical types of air-heated machines it was of advantage to study the properties of air on which drying depended. In the first place, heat was required in order to turn the moisture into vapour. The heat must be brought to the material by air. Secondly, the vapour must be taken out of the drying plant without recondensation, and so the air must not be quite saturated at the temperature at which it left the plant. As a rule it was found that if the air was half-saturated its capacity for further drying was diminished beyond the economy line, and, generally speaking, the result was good if a saturation to that extent were obtained. Curves were then shown illustrating Mr. Alliott's point, beginning with the calculation that the air was originally saturated fully at 10°C. The simplest way of testing the degree of saturation of the air was by the use of a wet and dry bulb thermometer.

As already explained, a certain amount of heat was carried away in the air which left the drier, but this was less in proportion as the discharge temperatures was higher, as the capacity of air for carrying moisture increased out of proportion to its rise in temperature. It was obviously, therefore, of advantage to discharge the air from the plant at as high a temperature and as fully saturated as possible. To effect this it was necessary to get enough heat in the air right at the beginning to enable it to evaporate as much moisture as it could carry away. The specific heat of air was low. A pound of water required, roughly, 1,100 B.T.U. to evaporate it, while a pound of air falling 1°F. gave out only 0·24 B.T.U. If the air, then, was to

be properly saturated at a high temperature of discharge the initial temperature would have to be very high indeed, such as was given by a direct furnace. As many materials, however, could not withstand a high temperature, the air was circulated repeatedly through the heater and drier, discharging only a small portion at each cycle. Thus, at low temperatures the desired saturation was attained by several reheatings and passages through the drier.

With many materials it was necessary to get them properly heated up throughout before any rapid drying began. Unless this was done a dry outer skin would be formed which would check the inner portions drying at all. This condition could be attained by circulating the air round and round in order to heat the material, for though the air was saturated very rapidly and could not do much drying it would, of course, be an efficient carrier of heat. When the material dealt with was properly warmed the degree of re-circulation was diminished and drying proceeded with faster or slower as the particular properties of the material required.

Mr. Alliott, after explaining a method which had been very successfully used in the drying of narrow-necked receptacles, drums and casks by means of a jet of air forced into the interior of the vessel, dealt with a steam-heated rotary continuous drier using hot air. A type of rotary drier much used for the treatment of sugar crystals after their discharge from the centrifugal drier was explained in detail, the example shown on the screen being steam-acketed in addition to having a current of hot air passing through it.

In the stationary type of drier a large amount of labour was necessarily involved in spreading the material in thin layers on the shelves and emptying them when dry. The capacity of such a drying machine depended upon the highest temperature the material would stand and upon how fast the air might be taken through the machine without creating too much dust. It was most important to understand this latter point because upon it depended very definitely the output and economy of the drier. Air-speeds might be as much as 10 ft. or 12 ft. per second, but very rarely exceeded 6 ft. or 7 ft., while for very dusty materials they might be as low as 3 ft. per second. Having settled the temperature and the air speed, the amount of air required to give the necessary evaporation could be calculated, and upon this calculation the diameter of the drier was based. The length of the machine depended less upon the amount of evaporation than upon the final dryness required. For drying sugar crystals a typical plant had a jacketed cylinder 4 ft. diameter by 15 ft. 6 in. long. The air from the heater would enter it at from 160°F. to 180°F. As a rule from 3 to 4 tons of sugar per hour would be passed through it, about 1½ per cent. of moisture being removed. Some users, however, appeared to be able to get capacities of over twice this figure. In dealing with ammonium nitrate the usual size of machine was 4 ft. diameter by 22 ft. long, unjacketed, dealing with about 30 cwt. of crystals per hour, reducing from 3½ per cent. to one-fifth of 1 per cent., and heating to 82°C. The air leaving the drier would carry away about 5 grains of moisture per cubic foot. In such a case the steam consumption would probably be about 4 lb. to 4½ lb. of steam condensed in the air heater per pound of water evaporated.

Mr. Alliott then described the Brownell Drier. This machine was specially adapted for dealing with coarse granular material, or products such as oil seeds and nuts, which required a long exposure.

Furnace Heated Plants

The most efficient forms of furnace-heated plants were closely allied to the type of machine previously described. The simplest method was, of course, to conduct flues from the furnace underneath the drying hearth upon which the material was spread out by hand. This was justifiable when there were ample waste furnace gases which could be profitably utilised, but if fuel was specially burned for the purpose the economy would be found to be low, and there would be high labour cost. Occasionally pans with stirrers were heated by fire, but again the method was uneconomical unless there was some waste heat to utilise. Batch machines of this type left a great deal of heat in the gases, and would again be uneconomical, if fuel had to be burnt specially to heat them, although labour costs might be much lower than in the former case. There was no doubt, however, that providing the material was suitable there was no more economical means of drying it than in an efficient continuous rotary fire-heated machine.

Steam Heated Driers

A simple type of batch machine was the Johnstone Drier, fitted with a mechanical agitating device. This machine was belt-driven through a bevel gearing of strong pattern, and there was a light vapour cover over the top of the pan, while there were steam jackets on sides and bottom, working with steam at 40 lb. pressure. In connection with this form of drier Mr. Alliott referred to the employment of two heavy knives, or ploughs, which rotated and scraped the bottom and sides, thus carrying a wave of material in front of them, also a stationary rake and swinging disc scrapers for the purpose of breaking up the material as it was pressed forward by the knives. The material was shovelled into the machine direct from the filter press or hydro extractor, and the product varied from a coarse meal to a fine powder, according to the nature of the material and the final degree of dryness. This type of machine was used, among other purposes, for drying crystals. It could also be worked under vacuum, with great advantage to output and ease with which a low final moisture was obtained.

The advantages to be gained in the use of vacuum in drying machines were then fully explained.

Concerning Boiling Points

During the course of his lecture Mr. Alliottt pointed out that the boiling point of films of water contained in fine capillary passages or pores in the material was different to that of free water. He was not speaking of combined water but of water in fine or hair-like passages. The smaller the passage the more the vapour pressure of the water was lowered. This lowering of the vapour pressure, however, was bound up with the vapour density, and as vacuum directly affected the latter it minimised the reduction of vapour pressure in addition to lowering the ordinary boiling point. In very fine passages resistance to the escape of vapour was very great, and even exceedingly large internal pressures might be powerless to overcome the resistance. If, however, the material was broken up into small pieces, not only could heat penetrate them more readily, but the capillary passages were broken up and shortened, and there was a much better chance for the last traces of moisture to escape. If the material was laid on a shelf or tray, undisturbed, these fine passages formed a very serious obstacle to the escape of the vapour, especially if a very dry product was required.

The advantages to be obtained from the use of agitation were (*a*) a great reduction of labour, (*b*) continually bringing fresh surfaces in contact with the drying medium, together with a disintegrating action, thus ensuring rapid and even drying, (*c*) a saving in space.

Prussian Blue

Mr. Alliott then dealt with a test in drying Prussian Blue on a 4 ft. diameter pan, jacketed on sides and bottom, provided with scrapers, and worked under vacuum, the charge being about 140 lb. of dry colour. This was fed into the machine with about 63 per cent. of moisture and reduced to about 0·1 per cent. final moisture in about seven hours, the dryness at any period being given by a chart which also showed a curve of the evaporation. It was noticeable that after the moisture had been reduced to 5 per cent. the rate of drying and evaporation fell off very considerably. Further points in connection with the curves for rate of evaporation and average hourly output, steam consumption, &c., were also explained in great detail.

Full explanations were then given of the Firman type of Agitated Drier, a Vacuum Ball Mill, the Passburg Continuous Drier, the Norwich Drier, a form of Cylindrical Film Drier, a Single Roller Film Drier and a Spray Drying Plant.

In concluding, Mr. Alliott said that each drying problem required special consideration according to the conditions and requirements of its particular case. There were quite a variety of considerations besides economy, and difficult drying problems were best solved by the co-operation both of the chemist and the engineer. Upon the one hand, the engineer had to give an efficient mechanical apparatus, but, on the other hand, the chemist could give considerable help in many cases, even if only by a small modification in the process, by which the product was rendered far more suitable for drying in an efficient and economical manner.

Sir Edward Tootal Broadhurst, of Manchester, writing to the *Manchester Guardian* in reference to the letter on the Manchester University Chair of Colloidal Chemistry, which Professors Dixon and Lapworth contributed to The Chemical Age of January 17, says: "I learn that there is a distinct misapprehension as to the position of the fund for this proposed new Chair. Apparently it is understood that the fund is completed. Unfortunately, such is not the case, as only some £11,000 has so far been promised towards the £25,000 required. In view of the importance of research in the cotton and other industries interested in colloids, it is to be hoped that the full amount will quickly be subscribed in order that the proposed department may start its work next session, as an immediate supply of men specially trained in the subject is necessary for successful research. I wish to point out also that this "Colloid" Fund is quite separate and distinct from the general appeal that the University is now making."

Lecturing on "Diesel Engine Castings" before the North-East Coast Institution of Engineers and Shipbuilders at Newcastle on Friday, January 30, Mr. F. J. Cook summed up the proportions of the various chemical elements in cast-iron that he had found to give good results for Diesel engine cylinder liners and pistons, as follows: Total carbon = 3 to 3·2 per cent., silicon = 1 to 1·2 per cent., phos. = not over 1 per cent., sulphur = 0·12 per cent., manganese = not over 0·5 per cent. Whilst chemical analysis gave the quantities of the elements present, the quality of the metal, the lecturer said, depended also upon how they existed as compounds and upon their association and relative distribution through the whole mass. Referring to Professor Turner's research work on the effects of silicon on cast-iron, Mr. Cook said that although the work had been carried out some 30 years ago, it had stood the test of time, and probably it was not too much to say had laid the foundation for the application of the science of chemistry to practical working in cast-iron.

Tungsten Evening at Newcastle

Papers before the Chemical Society

PROFESSOR P. P. BEDSON presided at a meeting of the Newcastle Section of the Society of Chemical Industry held on January 28, at the Newcastle Chemical Club at the invitation of the Club committee. Mr. J. Coggin Brown, of the Government of India Department of Industry and Commerce, read a Paper on "The Occurrence and Mining of Tungsten Ores in Burma"; and Mr. T. W. Moore read a Paper on "A Few Notes on Tungsten."

Before the Papers were read Mr. H. Dunford Smith, secretary of the Newcastle Section, reported that arrangements were well ahead for the annual meeting of the Society of Chemical Industry, which would probably be held in Newcastle on July 13. He also announced that a scheme was being considered to hold an exhibition of the chemical products of the district during July.

Dr. A. Fleck was appointed representative of the Newcastle Section on the Committee of the Electricity Department of Armstrong College.

Tungsten Ores in Burma: By Mr. Coggin Brown

Mr. Coggin Brown, after dealing at some length with the early research work on tungsten, said that for centuries there had been a small indigenous tin mining industry in Lower Burma. As far back as 1599 Ralph Fitch, an English adventurer, had mentioned the "Iland of Tavi from whence commeth great store of tinne." The earliest reference he could find of the occurrence of wolfram was made by Dr. Mason, an American missionary, who stated that certain Government officials had attempted to smelt wolfram sand under the impression that it was cassiterite. Wolfram was rediscovered in Tavoy by the Geological Survey of India in 1909, and was first exported in 1910, when about 400 tons were produced. At that time the world's production was about 6,000 tons of 60 per cent. WO_3 concentrates. The chief producing countries were then the United States, Portugal, Queensland, the Argentine and Bolivia. By 1911, with an output of 1,300 tons, Burma became the leading tungsten producing country in the world, a position maintained until 1916. The speaker described the entry of other countries into the industry, and stated that although Germany had no domestic supplies of importance, and possessed none in her foreign territories, she was supposed in 1913 to control two-thirds of the world's production. The British steelmakers generally obtained their supplies of finished tungsten products from the German manufacturers, and it was no secret that August, 1914, found this country with but a few months' stock in hand.

Mr. Brown then described how the English Government had assisted the miners in Burma, and how the output was increased from 1,688 tons in 1913 to 4,480 tons in 1917.

Tungsten ores, the lecturer stated, were almost invariably associated with the more siliceous granite rocks, and the most important metallogenic province was the Sino-Malayan one, which included Burma, the Shan States, the Malay States, the Dutch East Indies, Siam, Tongkin and South China. Regarding the distribution in Burma, wolfram and cassiterite had been found at intervals of over 750 miles in Burma, always in direct association with the granite ranges which stretched from the Shan States to the extreme south of the province. Textbooks stated that the Tavoyan field, the most important mining field of Burma, was characterised by universal presence of tourmaline, and that columbite was a common mineral in it. Both these statements were incorrect.

Methods of Mining

Coming to the actual mining operations the speaker remarked that the early methods were of a primitive character, and the industry still suffered because they had not been entirely eradicated. Of late years there had been a change for the better. Tributing was still largely practised, but was controlled; deep level work was carried on by compressed air-driven drills; concentrating mills had been designed and erected, and large scale mine plans and sections were required by the law. Wolfram was a difficult mineral to recover even by the most modern devices, possessing a perfect cleavage, and breaking into thin mica-like plates when powdered. He was of opinion that it was better to adopt a practice in which a minimum amount of fine material was produced, and that a concentration system which made full use of hand picking, coarse crushing in rolls, sizing and jigging was preferable to one in which the unsorted ores were taken direct from the mines to the stamps, and reduced to the consistency of powder before any attempt was made to separate their valuable contents. Prior to 1916 the mixed concentrates were shipped as they came from the mines. Then a magnetic separating plant was installed by the High Speed Alloys Mining Co., Ltd., so that a portion of the output was now separated before export. The machines used are of the Ulrich type.

Mr. Brown concluded by remarking upon the many erroneous ideas prevalent with regard to the behaviour of the natural tungates when exposed to the action of air and water. He did not agree with the classifications of Messrs. W. H. Emmons and A. H. Rastall, for instance. The rapidity with which wolfram decomposed in the surface soil was very remarkable, and was accounted for by its cleavage, resulting in its disintegration on movement with the production of a comminuted form eminently suited for chemical decomposition. Wolfram was readily leached from the outcrops of veins. The ready oxidation of its sulphide associates, yielding acid solutions which attacked the mineral, left nothing but cindery oxides of iron and manganese or a bloom of tungstic acid in the spaces once occupied by the crystals. The field evidence of Burma supported the theory that tungsten materials were somewhat soluble.

Notes on Tungsten: By Mr. T. W. Moore

Mr. T. W. Moore, in his Paper on "A Few Notes on Tungsten," said that no serious attempt to use tungsten for industrial purposes had been made before about 1850, when Mushet was granted his patent for the manufacture of tungsten steel. Up to 1898 tungsten steel was made in crucibles by the reduction of ore with carbon in the presence of iron. Then the electric furnace method was introduced and, at the present time, probably half of the total tungsten consumed was supplied in the form of ferro tungsten produced in the electric furnace. Mr. Moore projected a series of slides showing typical analysis of the most important ores, wolfram and scheelite. In manufacturing ferro-tungsten, wolfram was preferred, but in the manufacture of tungsten powder preference was usually given to scheelite. A detailed description of the methods employed in the manufacture of ferro-tungsten and tungsten powder was given. In a section dealing with the general facts of the subject, Mr. Moore mentioned that being insoluble in many acids and having a high melting point, tungsten was being proposed as a substitute for platinum in the laboratory It oxidised very slightly except at high temperatures. There was not, to the speaker's knowledge, any reliable volumetric method for the estimation of tungsten. It had been proposed to titrate the precipitated WO_3 with standard alkali and acid as in the case of phosphorus, but the proposal had not met with general approval. They must, therefore, rely upon gravimetric methods, which, as a rule, gave accurate results. At the works with which he was connected all the tungsten estimations were done by the alkaline fusion method. The finely divided sample was fused in a covered platinum crucible with nitric fusion mixture; the melt was dissolved in boiling water, any manganese present being precipitated by boiling with Na_2O_3 or methylated spirits. The solution was filtered, and the residue re-fused to extract the last traces of tungsten. The filtrate was acidified, with a slight excess of HNO_3, CO_2 expelled by boiling and tungsten precipitated with mercurous nitrate after the addition of a little HgO suspended in water. The precipitate settled immediately, was filtered, washed with hot water containing mercurous nitrate, dried, ignited, treated with H.F. and a little HNO_3, again ignited and weighed. The WO_3 was further purified by fusing with mixed carbonates, extracting with water, adding HCl followed by excess Am HO, Am_2CO_3. The precipitate was filtered off, washed with water containing AmNo3 and Am_2CO_3 untii free from Na and K salts, ignited and weighed, and allowance made in the usual way for the weight, which seldom exceeded more than two or three milligrams.

Discussion

Mr. F. H. SHARPE, in the course of the discussion, said that he would like to ask Mr. Brown if he had any theory as to the origin of bismuth; he had specimens which suggested that a sort of transmutation had taken place.

Dr. H. PEILE thought some figures regarding the cost would be very useful. The future depended on a regular supply at a low cost.

Dr. F. C. GARRETT said that Mr. Moore had referred to tungsten as a substitute for platinum in the laboratory. He had been making experiments with tungsten wire for quantitative analysis; for borax beads it had worked well and for flame colorations, too. The experiments had not been concluded, but he would put the results before the Section as soon as he had completed the work.

Mr. COULSON SMITH remarked that with regard to tungsten in filament lamps he had seen American statistics in 1910, which stated that the saving to U.S.A. would have been 46 million dollars if tungsten filament had been used instead of the ordinary filaments.

Mr. O. SMALLEY said that regarding the impurities in high-speed steel he had heard that in Sheffield now 1 per cent. of phosphorus was being used with safety, and Sheffield makers did not mind it at all.

Mr. COGGIN BROWN, briefly replying to the discussion, said that he could advance no particular theory on the presence of bismuth, but thought it belonged to a later epoch. Regarding the cost of production in Burma, at one time when the cost went up to 30s. per unit of WO_3, Tavoy was very pleased, but things had altered since then, and now many of the mines could not pay at 55s. per unit. With regard to the decomposition he agreed that the climatic conditions might account for it. He thought that 1·5 was the average concentrate in the Burmese field.

Mr. MOORE said that Mr. Smalley's remark on phosphorus in high-speed steel was news to him. He could not understand why such narrow limits of phosphorus should be imposed if there were no need for it.

A vote of thanks was accorded the authors of the Papers and to the Chemical Club for the invitation to hold the meeting on their premises.

The Lignite Deposit of Bovey Tracey

THE Devonshire lignite deposits which are to be utilised for the generation of electricity in connection with the establishment of the electrolytic copper refinery, referred to on page 155, are capable, states the *Times*, of effecting something like a revolution in the pottery industry, and also point the way to a substantial contribution to the solution of the problem of an adequate supply of home-produced oil. Clay in numerous varieties is transported to the Staffordshire potteries, and its cost, including transportation, is said to be approximately £3 a ton. It is estimated that the same clay could be put in the lignite-fired kiln in Devonshire at 5s. a ton. If these are accurate estimates, the future of the Five Towns may be uncertain. Crude oil is a by-product of the retorting process, by which lignite is converted into fuel, to the extent of from 15 to 35 gallons a ton, and, by distillation, up to 3 per cent. of motor spirit and 10 to 30 per cent. of paraffin can be obtained. Already the commercial development of some of these possibilities is in hand. Lignite in Devonshire is not a new discovery, and investigations were conducted by the Petroleum Research Department under the late Sir Boverton Redwood during the war. It was then found that a German company had been there first, and had acquired land and spent something like £100,000 before the war broke out.

Investigations Due to the War

Mr. J. A. Greene who, for some years before the war, had been investigating the production of oil from bituminous materials, and was closely associated with the work of the department, states that the lignites at Bovey Tracey have been known for many years, but it is to a very large extent as a direct result of the war that the great developments which are foreshadoweed have been made possible. In Austria and in Germany the getting and treating of lignite is an old-fashioned and highly profitable industry, and it is probably because we in this country have always been able to get a good and cheap coal from our own sources, without restriction or limit, and oils and by-products of one sort and another from the foreigner, also without restriction, that we have never taken any serious interest in the lignite deposits of Bovey Tracey. When, however, it suddenly dawned upon certain officials in Whitehall, about 1916, that the Germans had discovered the importance of oil in relation to the winning of the war, and that by accident or design many of the tankers bringing oil to this and Allied countries fell victims to the U-boats, it was decided that the time had really come to investigate the possibilities of producing oil from indigenous sources. The Petroleum Research Department was formed, and the first deposit of material investigated was the lignite deposit of Bovey Tracey. Subsequent work has proved the existence of an enormous bed of the highest grade lignite.

A New Smokeless Fuel

Dealing with the nature of lignite, Mr. Greene points out that lignite is "young" or immature coal, originating from the same sources as coal, and formed by the action of heat or pressure on vegetable matter. In its raw condition lignite is not suitable for use for the same purpose as coal, but if it is retorted there is produced a high-grade fuel, suitable for both domestic and industrial purposes. It can be compressed and sold in the form of briquettes. As a heating power it is equal to the best Welsh coal or anthracite, and is practically smokeless. It is an ideal fuel for suction gas producers, and experts are of the opinion that it will play a great part in the future development of heavy motor transport. It is rapidly ignited and gives out great radiant heat.

The value of the crude oil recovered in the process of retorting, deducted from the selling price of the solid fuel, will enable the fuel to be sold at considerably less than the price of coal. In addition to the motor spirit and paraffin yielded up by distillation, a valuable fuel, particularly suitable for Diesel and similar engines, and, under certain conditions, lubricating oil and paraffin wax are also obtained. Another by-product recovered from this particular lignite is Montan wax. This mineral is very valuable on account of its high melting point, and for this reason it is unequalled in the manufacture of high-grade boot polishes, gramophone records, and other articles. The yield of this wax from hand-picked pieces varies from 10 per cent. to as high as 40 per cent., and the production is at present almost exclusively a monopoly of Germany and Austria. Bulk experiments carried out upon the lignite in connection with the generation of electric energy show that at pre-war prices power could be produced at 0·06d. per B.Th.U.

As to the possible effect on the pottery industry, Mr. Greene states that for many years one of the chief industries carried on in Devonshire has been the exportation of clay. Even in pre-war days the cost of transport by rail or water of cheap fuel for firing the clay resulted in the establishment of potteries in the vicinity of cheap coal rather than in the vicinity of cheap clay. Hence the potteries of the North and of Staffordshire have been established where fuel is cheap, and the clays and other necessary materials are assembled there by one means of transport or another. The Devonshire clays include almost every variety of potter's and ball clay, and form the richest deposit of this material in Great Britain.

British Dyestuffs Supplies

Subsidy Proposed by Manchester Chamber of Commerce

A SPECIAL Committee of the Manchester Chamber of Commerce has considered the Imports and Exports Bill, with special reference to the dyes question. The following resolution was passed, and the board of directors have recorded their approval of it :—

"This Committee considers that the Imports and Exports Bill will not meet the requirements of national safety, and would be detrimental to research and the development of industry. The Committee, in viewing the Imports and Exports Bill, has concentrated particularly on the dye situation, and considers that the only satisfactory way of firmly and permanently establishing the dye-making industry in this country is for that industry to be subsidised by the State. The Committee has endeavoured to look at the problem from every angle of view, and, in consideration of the fact that plant such as that used in dye-making is necessary for producing materials of war, is of opinion that the Government should state what amount of plant it desired to be kept in commission for national safety.

"The Committee feels that a subsidy will be the means of rendering the dye industry the necessary assistance to enable it to become permanently established.

"Dye-making in this country on account of the merging of British Dyes, Ltd., and Messrs. Levinstein, Ltd., is so largely in the hands of this one corporation that it nearly becomes a monopoly. For this reason also the Committee considers that a body of consumers ought to be appointed, who should have monthly returns of all the dyes imported into this country, so that they could review the whole situation, and, if necessary, bring pressure to bear on British Dyestuffs Corporation, Ltd., should that corporation not support the consumer to the fullest extent. This information, which should also be available to the dye-makers, would also be of great assistance to the Government, who would thereby be able to see if the money it gave in subsidy was being wisely and energetically used. The Committee feels that the Board of Trade should be interviewed on the whole question, and how best to collect these returns. The following machinery is suggested as a means to this end :—

"The Board of Trade to make it compulsory that the exact particulars of prices, &c., of all dyestuffs brought into this country are made in the form of a monthly return for the Board of Trade.

"That there should be a voluntary committee of colour users.

"That for the purposes of subsidy the Board of Trade representative should take evidence when necessary from the committee suggested under clause 2.

"The Committee feels that there is only one other possible way of fostering the dye industry—that is, by protection in the form of tariffs. Tariffs, it submits, though helpful to the dye industry, do not meet the requirements of national safety, as the Government thereby would have no guarantee that the necessary plant would be kept in commission. Also, tariffs are against the interests of consumers of dyes.

"The Committee feels that any form of prohibition or licence would be detrimental to the dye users."

The Special Committee is composed of Messrs. E. F. Stockton (chairman), F. W. Astbury, M.P., R. H. Cawley, H. V. Kilvert, B. Longbottom, J. G. Nidd, A. Rée, E. Rhodes, C. Roberts, H. Sumner, V. Clay and H. C. Clanahan.

Allen, Harding & Co.'s Successful Appeal

IN the Court of Appeal on Tuesday, before Lords Justices Bankes, Scrutton and Atkin, the appeal of Allen, Harding & Co., Ltd., against the judgment of Mr. Justice Roche awarding the plaintiffs damages for breach of contract in the case of Kirsch (J. A.) & Co., and another *v.* Allen, Harding & Co., Ltd., was allowed. The plaintiff company was incorporated in the United States and carried on business as merchants in New York. The defendant company carried on business as merchants in England. The action was brought for damages for breach of contract to accept and pay for a quantity of condensed and evaporated milk which, the plaintiffs alleged, the defendants had bought from them for delivery at certain dates in 1918. Mr. Justice Roche had found that on the correspondence and on the telegrams there was a concluded agreement between the parties, and he also found that the defendants had committed a breach of the agreement. He gave judgment for the plaintiffs for damages. On the hearing before Mr. Justice Roche the only point of interest in the case was concerned with the date on which the damages were to be assessed, having regard to the variation in the rates of exchange between this country and America, but in the view which the Court of Appeal took of the facts of the case that point did not arise and was not decided. Their Lordships, in their judgments, dealt at some length with the telegrams and the letters and found that the parties were not *ad idem* on the question of the opening of credits, and that there was no concluded contract. The appeal was allowed and judgment was entered for the defendants.

From Week to Week

PROFESSOR W. A. NOYES has been elected President of the American Chemical Society for 1920.

MR. FREDERICK SODDY, Dr. Lees Professor of Chemistry at Oxford University, has been elected to a studentship at Christ Church.

A SITE of between 4,000 and 5,000 square yards in Station Road, Otley, has been sold to Mr. T. Rhodes, an Otley and Leeds candle manufacturer, for the erection of a candle factory.

THE DEATH is announced, in his 73rd year, of Mr. M. P. Ismay, second son of the late Mr. J. Ismay, founder of the firm of J. Ismay & Sons, manufacturing chemists, of City Road, Newcastle.

PROFESSOR R. WILLSTATTER, of Munich, has been appointed to the Chair of Chemistry in the University of Berlin, which became vacant by the death of Emil Fischer.

PROFESSOR W. NERNST, director of the Institute of Physical Chemistry in Berlin has been elected a foreign member of the Swedish Academy of Sciences in Stockholm.

MR. L. G. LEWIS, proprietor of the Pontardawe Chemical Works died last week in his 90th year. On account of his advanced age he had entrusted the management of the works for several years to his sons.

MESSRS. J. & A. CHURCHILL announce the early publication of a new work entitled "A Laboratory Manual of Elementary Colloid Chemistry," by Mr. Emil Hatschek, a well-known authority on this subject.

AN ORDER has been made cancelling, as from February 1, 1920, Army Council Orders concerning the control of hides, kips and calf skins. These goods will now be administered by the Ministry of Food.

SIR HERBERT PARSONS, one of the principals of Ashton & Parsons, wholesale chemists, La Belle Sauvage Yard, E.C., owing to pressure of business, is retiring from the L.C.C., after serving for eight years as an alderman.

STEEL BELT CONVEYORS, LTD., Falkland Works, Manchester, announce that, for the convenience of management, they are removing their head offices to Birmingham, and all communications should in future be addressed to them at Norwich Union Chambers, Birmingham.

THE MILL CLOSE lead mines, near Matlock, have just changed hands, the new owner being Mr. Chambers, of the Stanton Iron Works. The price of the deal has not been disclosed, but the mines have for 60 years been very productive in lead, and hold the position of being the third largest producers of ore in the British Isles. The late owners have awarded £10,000 to their employees as a mark of esteem.

MR. HERBERT A. BATES, London manager of the Amsterdam Superphosphate and United Chemical Works, announces that in consequence of his present office at 33, Bishopsgate, E.C., being required by the landlords (The Russian and English Bank), for an extension of their business, all communications should in future be addressed to him at 80, Bishopsgate, E.C. (London Wall 1976), ground floor, in the office of C. J. Parker & Co.

THE CASE of R. Martens & Co., Ltd., *v.* the Aniline Dye & Chemical Co., Ltd., was mentioned to Mr. Justice Roche in the King's Bench Commercial Court on Monday, February 2. Mr. Claughton-Scott, for the plaintiffs, said that terms had been agreed and endorsed on Counsel's briefs. Judgment was sought in these terms, and his Lordship made an order accordingly. The terms arrived at were not disclosed.

AT A MEETING in London on Tuesday, held under the auspices of the Association of Great Britain and France (Industry and Economics), the scheme for the creation of a "Paris-Marché-du-Monde," a central organisation for wholesale producers and buyers, was fully explained by M. Bessonveau (president of the Paris-Marché-du-Monde), M. Brevaire (managing director), and Major Amos-Wilkins (British representative in connection with the scheme).

"OLD CENTRALIANS" (members of the Old Students' Association of the City & Guilds Engineering College of the Imperial College of Science, London) have arranged to hold a reunion dinner, the first for six years, at 7.30, on Saturday, February 21, at the Waldorf Hotel, Aldwych. Professor Armstrong, F.R.S., Professor Unwin, F.R.S., and Sir Alfred Keogh have accepted invitations to be present. Tickets, price 15s. each, may be obtained from Mr. G. W. Tripp, Lyndhurst, Hayes Road, Bromley, Kent.

MR. MONTAGU VILLIERS, Commissioner in Scandinavia for the Overseas Service of the Federation of British Industries, was in Birmingham last week interviewing Midland manufacturers upon the possibilities of trade in that country. He stated that for some years before the war Scandinavia had felt that British manufacturers had neglected her with regard to the supply of manufactured goods. There was at the present time a great shortage in Scandinavia of most classes of chemical goods, of lamps and lamp glasses, and of scientific instruments and glass.

A VERDICT of accidental death was returned at the inquest at Llanelly, last week, on A. G. Heath (46), a process worker at Pembrey Munition Works, who was killed by the explosion of a shell he was handling. Capt. Horne, senior danger buildings officer at the factory, was of opinion that the explosion was caused by Heath attempting to overcome resistance caused by oxidisation or damage. The tool used was damaged and looked as if it had been hammered, which, of course, was contrary to instructions.

A PROPOSAL for the establishment of a permanent international dye commission, to be composed of representatives of Great Britain, France, Italy, Switzerland and the United States, has been made to the British Board of Trade by American dye interests. The proposal, it is stated was made unofficially by a delegate from the States representing large American interests. The plan contemplates the appointment of three representatives of each nation. The Commission would have only advisory powers.

ONE OF THE MOST striking wall calendars for 1920 is that just received from L. B. Holliday & Co., Ltd., of Huddersfield, manufacturers of coal-tar dyestuffs, intermediate products, &c. The brilliance and wide range of colours in which the firm's products are made are very effectively suggested in the artist's rather free treatment of a sunset effect, with broad bands of colour rising over a sea foreground of deep blue. It is an artistic type of advertisement and makes quite a good decorative picture for the office.

THE FOLLOWING SUCCESSES in chemistry and bio-chemistry have been obtained in the London University, M.Sc. examination, for internal students: Chemistry: D. H. Burleigh, Imperial College, Royal College of Science; W. E. Garner, University College; C. K. Ingold, Imperial College, Royal College of Science; Olive Workman, University College and Imperial College, Royal College of Science; A. T. S. Zealley, University College. Bio-Chemistry: Annie B. Clark, Bedford College; H. D. Elkington, King's College.

THE NEW ORDER prohibiting the employment of women in glass-works, which came into force last Saturday, is calculated seriously to dislocate the industry in South Yorkshire. In the South Yorkshire area Mexborough and Barnsley are the two places chiefly affected; and the Mexborough Employment Committee, in conjunction with Barnsley, have applied to the Home Office, through the Superintendent Inspector of Factories, Leeds, for the suspension of the Order, as it affects their districts, until December 31. In the meantime, every effort will be made to replace the women by boy labour.

LORD LEVERHULME, who returned last week from his visit to America, stated that one of the things which impressed him most was the enormous prosperity of the country, and the speed with which building—houses, factories and office blocks—was proceeding. For a new building at Toronto, which Lever Brothers were proposing to erect, he received a tender from a Toronto firm at a less price per cubic foot than a quotation given for exactly a corresponding building proposed to be erected at Port Sunlight this year. Amongst American business people, and especially those engaged in industrial chemistry, Lord Leverhulme's visit was regarded with great interest. Lever Brothers have a large establishment at Cambridge, Mass., and Lord Leverhulme, in investigating American business methods, naturally did not neglect to visit the company's own works.

LIEUT.-COL. GREGORY, V.D., formerly the Superintendent of the Opium Factory at Ghazipur, India, died in London last week. Col. Gregory belonged to a well-known Armenian family. Born in December, 1851, at Calcutta, he was a British subject by virtue of the charter granted in the days of "John Company" out of gratitude for the help rendered by the Armenians to the British. He came to England when quite young, and was educated at Harrow and at Trinity, Cambridge. He then took an appointment under the Government of Bengal. He came home in 1885 and studied at South Kensington, where he took honours in chemical analysis, and after this was appointed by the Government of India to the Superintendentship of the Opium Factory at Ghazipur. On his retirement some years ago he came back to England and until his death worked untiringly in the cause of the Armenians.

SIR GERARD MUNTZ is at the head of a syndicate which proposes to spend approximately £10,000,000 in the establishment, in the vicinity of Newton Abbott, Devonshire, of an electrolytic refinery capable of producing 100,000 tons of copper a year for use in this country, using, as far as possible, British copper in blister form. The establishment of such a refinery was strongly recommended by the Non-Ferrous Metal Trades' Committee, whose investigations have brought to light serious defects in the copper industry of Great Britain. At present 90 per cent. of the copper used here comes from the United States, a large percentage of the ore being taken to the States from British possessions to be refined before it can be used in this country. The site chosen for the proposed refinery is stated to be excellent as there are tide-water facilities, and a bed of over 800 million tons of lignite available for the generation of electricity at a very cheap rate. Mr. H. J. Wilson, who originated the scheme, at first intended to utilise the water power of the Dartmoor plateau, but so much opposition was shown that it has been decided to abandon that scheme for the present.

References to Current Literature

Only articles of general as distinct from specialised interest are included and given in alphabetical order under each geographical subdivision. By publishing this digest within two or three days of publication or receipt we hope to save our readers time and trouble; in return we invite their suggestions and criticisms. The original journals may be consulted at the Patent Office or Chemical Society's libraries. A list of journals and standard abbreviations used appeared in our issue of December 27 last.

British

ANALYSIS. Pyridine and ammonia, estimation and separation—an application of the electrolytic dissociation theory. E. B. R. Prideaux. *Trans. Faraday Soc.*, December, 137-147. A method for analysing mixtures of these bases has been worked out.

The estimation of organic chlorine and bromine by the chromic acid method. P. W. Robertson. *Chem. News*, January 30, 54.

COMBUSTION. The propagation of flame in mixtures of methane and air. I. Horizontal propagation. W. Mason and R. V. Wheeler. *Chem. Soc. Trans.*, January, 36-47.

The propagation of flame in complex gaseous mixtures. IV. Uniform movement of flame in mixtures of methane, oxygen and nitrogen. Maximum speed mixtures of methane and hydrogen in air. W. Payman. *Chem. Soc. Trans.*, January, 48-58.

FURNACES. Improvement in the construction of furnaces. W. N. Booth and G. H. Roberts. *Gas J.*, January 27, 188-189. A new type of gas furnace is described.

GAS. A water-gas sampling device. R. A. Carter. *Gas J.*, January 27, 196-197. Paper read before the American Gas Association.

GLASS. Further investigations on chemical glassware. C. M. M. Muirhead and W. E. S. Turner. *J. Soc. Glass Tech.*, October, 129-131. The action of reagents on some American laboratory glass has been studied.

The year's progress in glass research under the auspices of the Glass Research Delegacy. W. E. S. Turner. *J. Soc. Glass Tech.*, October, 132-144.

Some recent improvements in the design of glassworks, furnaces and gas producers. J. S. Atkinson. *J. Soc. Glass Tech.*, October, 148-166.

The glass industry of North America. W. E. S. Turner. *J. Soc. Glass Tech.*, October, 166-200. A comprehensive survey.

IRON. The magnetic and mechanical testing of iron. *Engineering*, January 30, 136-138. Excerpts from a Paper by J. N. Gebert before the American Society for Testing Materials.

LEATHER AND OILS. Industrial uses for the shark and porpoise. A. Rogers. *J. Soc. Chem. Ind.*, January 31, 9-10T. The production of leather and oils is described.

METALS. Occurrence of rare metals in the Union of South Africa. *S. Afr. Eng.*, January, 7-8.

OILS. The mechanism of the addition of hydrogen to unsaturated glycerides in the presence of finely divided nickel. R. Thomas. *J. Soc. Chem. Ind.*, January 31, 10-18T. A valuable theoretical and experimental contribution to the knowledge of hydrogenation.

ORGANISATION. The size of works and efficiency of control. *Engineering*, January 30, 135-136.

PLASTICS. The softening of plastic materials determined by the Widney resiliometer and expressed graphically. The working of the apparatus is described, and tests made with it are recorded on curves.

POWER. Recent advances in the utilisation of water power. E. M. Bergstrom. *Engineering*, January 30, 140-143. A Paper read before the Institution of Mechanical Engineers.

REPORTS. Reports on progress in chemical industry in 1919. *J. Soc. Chem. Ind.*, January 31, 29-33R. Further brief reports are given covering gas, iron and steel, non-ferrous metallurgy, sugar, fermentation industries, rubber and leather. (See *Chem. Age*, 1920, 102.)

SEEDS. Report on the proposed electrolytic treatment of seeds (Wolfryn process) before sowing. E. J. Russell. *J. Bd. Agric.*, January, 971-981. An interesting account of successful trials with the process.

SULPHURIC ACID. The solubility of sulphur dioxide in sulphuric acid. J. D. Miles and J. Fenton. *Chem. Soc. Trans.*, January 59-61.

French

ACETYLENE. Determination of acetylene in gaseous mixtures. J. A. Muller. *Bull. Soc. Chim.*, January 5, 69-71. The process used depends on the precipitation of copper acetylide.

AMMONIA. The advantages of the synthesis of ammonia at high pressures. G. Claude. *Comptes rend.*, January 19, 174-177. (See also *Chem. Age*, 1919, 696.)

SODIUM NITRITE. The reversible oxidation of sodium nitrite. C. Matignon and E. Monnet. *Comptes rend.*, January 19, 180-182.

RESINS. Characters of some resins from Cochin China. P. Nicolardot and C. Coffignier. *Bull. Soc., Chim.*, January 5, 71-74. A number of resins have been examined.

United States

ABSORPTION. The absorption of gases in spray systems and towers. E. M. Baker. *Chem. Met. Eng.*, January 22, 122-124. The fundamental principles of the process are discussed.

AMMONIA. The catalyst for the oxidation of ammonia. G. A. Perley. *Chem. and Met. Eng.*, January 21, 125-129. The various forms of platinum catalyst used are described and discussed.

COPPER. Production of copper from secondary material. L. Addicks. *Chem. and Met. Eng.*, January 21, 119-122. The treatment of waste, mill, metallurgical and refinery products containing copper is described.

EXPLOSIVES. The handling of high explosives in war time. G. L. Carden. *Eng. and Min. J.*, January 3, 17-23. An interesting account of the methods used in New York.

FRANCE. The mineral industries of France. M. Altmayer. *Eng. and Min. J.*, January 3, 12-16. A description of the industries as affected by the war.

IRON. Economics of electric iron and steel production in Scandinavia. J. W. Richards. *Chem. and Met. Eng.*, January 14, 61-62.

MAGNESIUM. The present status and outlook of the magnesium industry. J. T. Rooney. *Chem. and Met. Eng.*, January 14, 60-61.

MELTING POINTS. Melting point methods at high temperatures. II. L. J. Dana and P. D. Foote. *Chem. and Met. Eng.*, January 14, 63-70. The determination of melting points by the thermo-electric resistance and optical pyrometers is described. (See also *Chem. Age*, 1920, 102.)

MOLYBDENUM. Wulfenite; its concentration and separation from barite. J. P. Bonardi. *J. Franklin Inst.*, January, 47-61. Satisfactory recoveries of molybdenum are recorded.

PHOTOGRAPHY. Hypersensitising commercial panchromatic plates. S. M. Burke. *J. Franklin Inst.*, January, 25-46. The results of many experiments are given.

PYRITES. Some chemical data on coal pyrite. H. F. Yancy. *Chem. and Met. Eng.*, January 21, 105-109.

REFRACTORIES. Furnace for testing firebricks under load at high temperatures. C. H. Lovejoy. *Chem. and Met. Eng.*, January 21, 109-110.

SHALES. The eventual plant for the distillation of oil shales. L. Simpson. *Chem. and Met. Eng.*, January 14, 71-72. The probable developments of the industry are discussed, and the questions of producing ammonia, potash and cement as by-products.

WOOD. Inaccuracy of treating records due to moisture in wood. E. Bateman. *Chem. and Met. Eng.*, January 14, 57-59. A discussion of the process of preserving wood with solutions of salts.

ZINC. Electric resistance furnace of large capacity for zinc ores. C. H. Fulton. *Chem. and Met. Eng.*, January 14 and 21, 73-79, 130-135. The furnace and process and their operation are fully described.

German

AMMONIA. The formation of free hydrogen in the reversed ammonia flame. C. G. Müller. *Z. angew. Chem.*, January 20, 24.

ANALYSIS. Determination of arsenic in salvarsan and neosalvarsan. Utz. *Pharm. Zentralh.*, Jan. 22, 39-42.

Detection and determination of traces of chromium in silicate and carbonate rocks and ores. O. Hackl. *Chem. Zeit.*, January 20, 63.

Separation and estimation of bismuth and lead. G. Luff. *Chem. Zeit.*, January 22, 71.

The presentation of analytical results. A. Thiel. *Chem. Zeit.*, January 27, 81-82.

Physico-chemical analysis of metal oxide sols. W. Pauli. *Koll. Zeits.*, January, 20-23.

Analytical processes in presence of phosphoric acid. H. Remy. *Z. anal. Chem.*, Vol. 58, No. 9, 385-392.

Estimations of crude fibre. O. Nolte. *Z. anal. Chem.*, Vol. 58, No. 9, 392-297.

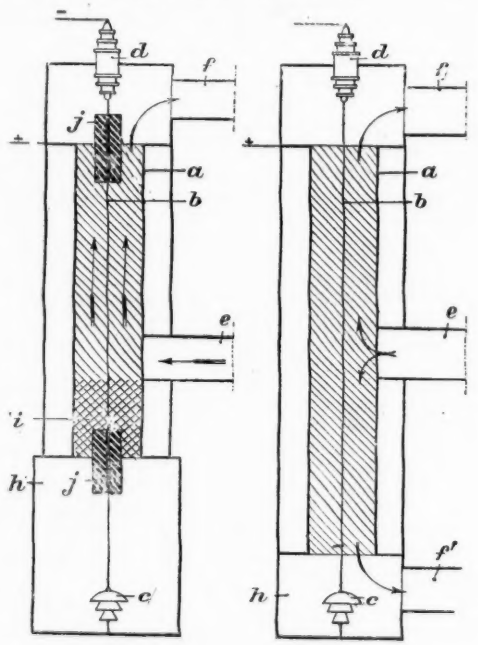
Aims and organisation of research in the field of analytical chemistry. W. Böttger. *Z. angew. Chem.*, December 30, 389-393. The need for systematic organisation of research in analysis is urged.

Patent Literature

We publish each week a list of selected complete specifications accepted as and when they are actually printed and on sale. In addition, we give abstracts within a week of the specifications being obtainable. Readers can thus decide what specifications are of sufficient interest to warrant purchase, the only way of obtaining complete information. A list of International Convention specifications open to inspection before acceptance is added, and abstracts are given as soon as possible.

116,104. ELECTRICAL SEPARATION OF SUBSTANCES IN SUSPENSION IN GASEOUS MEDIA, APPARATUS FOR. Société Gallot & Cie, 9, Rue Mechain, Paris, and Société Poussin Rondeaux & Cie, 29, Rue Etienne Marcel, Pantin (Seine), France. International Convention date (France), May 22, 1917.

In apparatus for electrically separating substances in suspension in gases by passing the gas between two electrodes charged to a high potential, it is usually difficult to insulate the electrodes, owing to the presence in the surrounding medium of substances capable of being conductors. The object is to secure good insulation. The gas is passed through the perforated tubular electrode *a* in the axis of which a wire *b*, constituting the second electrode, is stretched. The wire is supported at its ends by insulators *c*, *d*, the former of which is usually in the path of the untreated gas and consequently soon receives a deposit which affects its insulation. To avoid this, the gas inlet pipe *e* opens against the perforated electrode *a* a short distance above the chamber *h*, so that a protecting zone *i* receives and collects the dust which would otherwise pass into the chamber *h*. A similar protection for the insulator *d* is not necessary, since it is in contact with clean gas only. If additional insulators *j* are used to produce a uniform electric field, the lower of these electrodes is also protected by the zone *i*. In a modification, the protecting zone *i* may be dispensed with, the inlet pipe *e* being placed centrally as shown, and outlet pipes *f*, *f'* for the clean gas being provided at each end. In another modification the protecting zone *i* may be formed as an auxiliary tubular electrode separated from the main electrode *a*.



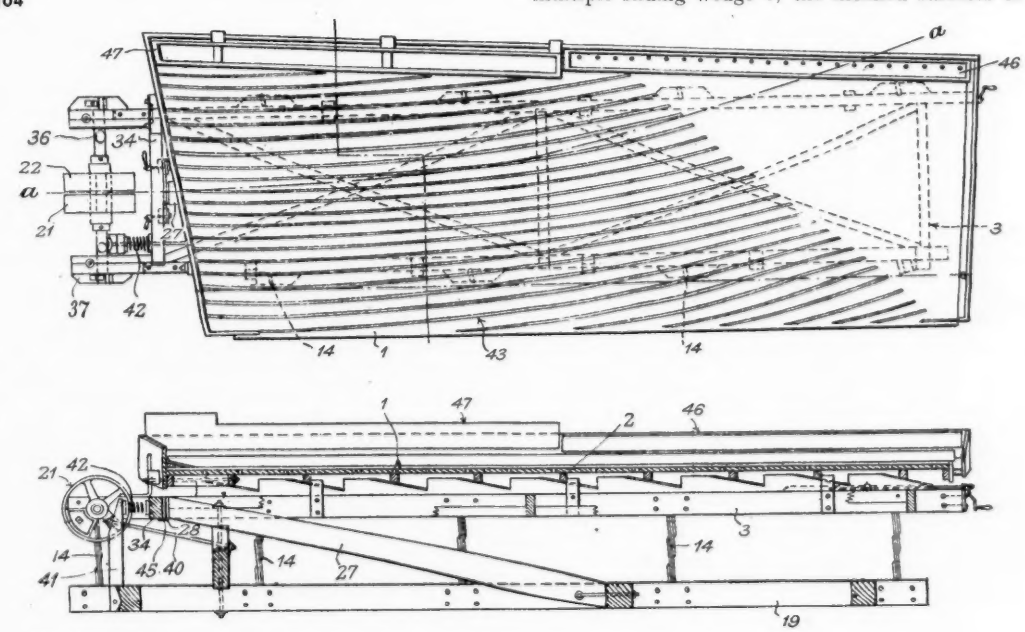
116.104

135,816. ELECTRO-OSMOTIC PROCESSES, ELECTRODES FOR. Elektro-Osmose Aktiengesellschaft (Graf Schwerin Gesellschaft), Lindenstrasse 35, Berlin, S.W. 68. International Convention date, (Germany) October 20, 1917.

The electrode consists of two parallel perforated sheets separated by distances pieces or by a corrugated sheet, so as to form a grate-like carrier. A wire fabric is removably fixed over the two perforated sheets.

137,110. ORE CONCENTRATORS. G. A. Overstrom, 530, South Marengo Avenue, Pasadena, Cal., U.S.A. Application date, December 31, 1918.

The apparatus is of the type in which the finely divided ore is washed on an inclined riffled table. The table top 1 is attached to a shaking frame 3 by hinge members, and its inclination is adjusted by the longitudinal movement of a multiple sliding wedge 6, the inclined surfaces of which co-

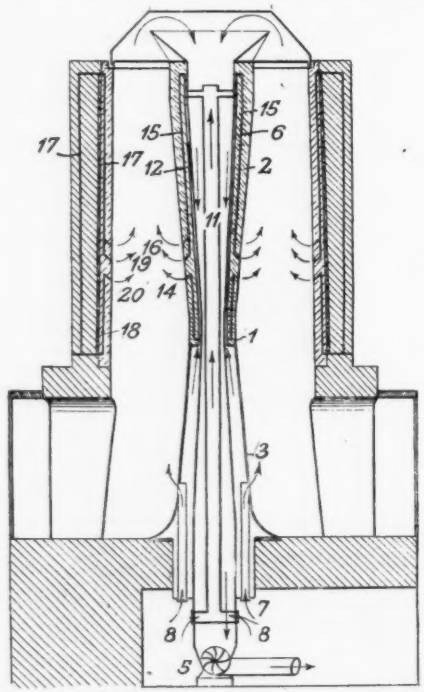


137,110

operate with the cross beams **2**, so as to raise the edge 46, 47. The frame 3 is attached to the fixed base frame 19 by flexible leaf springs 14, so that it is free to oscillate logitudinally. A horizontal shaft 36 is fixed in the end of the frame 3, and carries two rotatable pulleys 21, 22, the pulley 21 being out of balance. When the driving belt is shifted from the pulley 22 to the pulley 21, the vibration due to the unbalanced weight sets up an oscillation of the table 1. The table top is provided with riffles 43, which are curved away from the lower edge of the table, so that the ore which is fed from the box 47 is deflected upwards, and the water from the box 46 is caused to flow backwards over the material. It is unnecessary to change the inclination of the table with a change of values in the ore, as the greater weight of material on the table automatically varies the amplitude of its vibration and keeps the material distributed over its surface. The leaf springs 14 may be slightly inclined so that the oscillation produced is not quite longitudinal but along the axis *a*—*a*. A fixed beam 27 is provided with a vertical face 28 which is engaged by a pad or buffer 45 attached to a cross-bar 34 of the frame 3. A spring 42 extends between the cross-bar 34 and a support 41 which is adjustable by the rod 40, to vary the tension of the spring. The necessary difference between the forward and back strokes of the table is obtained by the impact of the buffer 45 at the end of the forward stroke, so that the loose material resting on the table is moved forward at each stroke. The apparatus ensures a rapid and efficient separation of concentrates and tailings without the use of complicated mechanism, and with only one bearing (that of the pulley 21) which is subject to wear.

137,168. Shaft Furnaces and Gas Producers. E. F. Chaudiere, 22, Rue de la Condamine, Paris. Application date, March 3, 1919.

The object is to provide more uniform ventilation, and to economise fuel in shaft furnaces used for the manufacture of lime, cement, or for roasting and calcining ores, and in blast furnaces, gas producers, &c. The furnace is provided with a core 1 in the form of a double cone, 2 3, formed of two concentric tubular cast-iron columns 6 and 11 connected together by ribs. The upper part is surrounded by refractory masonry containing circulation and recuperation flues, and the lower part is surrounded by a hollow wedge-shaped column 3. A fan 5 draws a current of air into the furnace through openings 7 and 8, which are provided with dampers. The air entering at 7 escapes at 10, and the air entering at 8 rises in the central column 11, where it is preheated. The ring of openings 7 are arranged alternately with similar openings not shown, which communicate with flues 12 just outside the outer cast-iron column. Air is also drawn into these flues, and part of it escapes through the openings 14 to the furnace, while the remainder passes upward through the flues 15 to meet the air emerging from the tube 11. The hot air then passes down through the flues 15 and through the openings 16 into the furnace. The material at this zone thus becomes strongly heated. Additional flues, 17, 18, may be provided in the outer wall of the furnace, and air is drawn through them, preheated, and delivered through the openings 19, 20 into the furnace. The top of the furnace is closed by a cover as shown. The arrangement renders it possible to use fuel of inferior quality in the furnace.



137,168

137,171. Fertiliser and Method of Producing the Same. P. Radmann, Götgatan 69, Stockholm. Application date, March 5, 1919.

A mixture of rock such as feldspar 1 part, gypsum 0·25 to 1 part, and limestone 1 part, is heated to a temperature below that at which the mixture fuses, preferably 1,000°–1,200°C. The mass is then mechanically disintegrated without washing and used as a fertiliser. It is found that the fertilising value of the product exceeds either that of the soluble alkaline compounds by themselves, or the sum of the fertilising values of the alkaline compounds and the lime in a mixture of these. If desired, an addition of 1·5 parts of rock phosphate may be added to the mixture before heating.

137,214. 3:6-Diaminoacridine, Manufacture of. W. P. Thompson, Liverpool. (From Poulenc Freres, 92, Vieille-du-Temple, Paris, and R. Meyer, 71, Rue de la Faisanderie, Paris.) Application date, May 1, 1919.

3:6-Diaminoacridine is made by fusing *m*-phenylenediamine, $C_6H_4(NH_2)_2$, with formic or oxalic acid, glycerine or other polyvalent alcohol, and a condensing agent, such as zinc or calcium chloride. As an example, a mixture of *m*-phenylenediamine 6 parts, crude oxalic acid 7 parts, fused zinc chloride 10 parts, and industrial glycerine (28°B.) 10 parts, is heated to 130°C., till the evolution of carbon dioxide ceases, and then to 150°–170°C. for two hours. The resulting mass is heated with water and ammonia, when diaminoacridine is precipitated, and recovered by filtering.

137,247. Propylene, Process of Producing Chlorination Products of. E. C. R. Marks, London. (From Union Carbide Co., 42nd Street Building, New York.) Application date, July 2, 1919.

The process is principally for producing propylene dichloride. Liquid chlorine is passed into an initial excess of liquid propylene, both being at atmospheric pressure, and propylene dichloride is rapidly formed. If the chlorine is in excess higher chlorinated derivatives are also produced. (Compare Patent No. 136,489, The Chemical Age, Vol. II., page 76.)

International Specifications Not Yet Accepted

135,510. Catalysts. A. Brochet, 14, Rue de l'Abreuvoir, Montereau, Seine et Marne, France. International Convention date, May 1, 1915.

To produce a catalyst for hydrogenating or dehydrogenating organic substances, an organic salt of a catalytic metal, such as nickel, cobalt, iron, copper, manganese or cerium, is heated out of contact with air. Formates, oxalates, acetates or lactates may be used, or a mixture of salts such as sodium formate and nickel sulphate. Inert substances, or substances which modify the catalytic activity, such as infusorial earth, silica, boric acid, and salts, such as the carbonates, formates, or oxalates of the alkali, alkaline earth, and earth metals may also be added. Some of the additions act as supports for the catalyst, and an alternative support may consist of the same catalytic metal in the form of wire, strip, sheet, &c., the organic salt being applied on the surface. The production of the catalyst may be affected either by a dry or wet process. If the latter, the liquid may be inert or a solvent, or may be the substance to be acted on by the calalyst. In the case of oils, paraffin, naphthols, nitro-naphthalene, &c., the hydrogen

evolved may serve for hydrogenation or reduction. In the case of phenol, cresols, and certain nitro derivatives, an increased pressure may be employed to raise the boiling point of the liquid to the decomposition temperature of the organic salt. The catalyst is regenerated by washing with water, then heating to form the oxide, and then converting the latter to formate or oxalate, which is treated as above. Such catalysts may be used for hydrogenating fats, oils, fatty acids and their ethers, cinnamates, geraniol, terpenic products, aldehydes, ketones, indigo and its substituted derivatives, vat and other dyes and nitro derivatives. Nitrated and oxy-nitro derivatives may be reduced.

135,516. BLEACHING PROCESSES. E. T. J. Watremez, 67, Boulevard Gambetta, Nice, France. International Convention date, November 8, 1918.

Vegetable fibres are scoured to facilitate subsequent bleaching, in a bath made by treating a metal such as zinc, or metallic oxide, with an alkali, alkaline hypochlorite, and a soluble reducing salt. The bath is heated to boiling point and further alkali added if necessary, to render it alkaline, and after treatment slaked lime or milk of lime is added to the fibre to precipitate the substances remaining in it. The precipitated substances are removed by treatment first with ammonia and then with acid.

135,817. ELECTRIC ENDOSMOSE. Elektro-Osmose Akt.-Ges. (Graf Schwerin Ges.), Lindenstrasse 68, Berlin. International Convention date, October 20, 1917.

In dehydrating vegetable, animal, or mineral substances, such as clay or peat, by electro-osmotic treatment, the liquid separated is used for preparing fresh material for treatment, either by mixing or grinding the material in the liquid or by using it for washing out the material as in hydraulic mining. If the liquid does not contain sufficient electrolyte to bring the material into the "sol" condition, a further quantity of electrolyte may be added. When clay is treated, the liquid contains caustic soda from the previous charge, and when peat is treated, it may contain ammonia also.

135,831. SODIUM BICARBONATE. T. Nishigawa, 5, Hikawa Cho, Akasaka, Kui, Tokyo. International Convention date, November 29, 1918.

The mother liquor from the ammonia soda process is cooled below 5°C., sodium chloride is added in amount equivalent to the bicarbonate which has separated, and sufficient ammonia is added to convert the bicarbonate into carbonate. Ammonium chloride separates out and the sodiun bicarbonate is converted into sodium chloride, the liquor being then suitable for use again as brine in the ammonia soda process. The ammonia is obtained by converting the nitrogen from the carbonators into cyanamide and treating the latter to produce ammonia. Alternatively, ammonia may be obtained from the nitrogen by catalytic synthesis.

135,844. TREATING ORES. Dorr Co., 101, Park Avenue, New York. (Assignees of D. S. McAfee, 867, West 181st Street, New York.) International Convention date, August 16, 1918.

Ore obtained from iron pyrites burners is classified into sands and fines, and the former is leached and treated in a Dwight-Lloyd sintering apparatus. The hot produet is passed over a grizzly and the oversize collected and smelted. The fines from the classifier are passed through thickeners, mixed with water, and sprayed on to the undersize sintered material, which is thus quenched and the slimes dried. The product is again passed through the sintering apparatus.

135,847. CALCIUM CYANAMIDE; FERTILISERS. P. Savés, 6, Port St. Etienne, Toulouse, France. International Convention date, November 26, 1918.

Calcium cyanamide is mixed with potassium or other silicate, dried, and granulated by crushing. The quantity of potassium silicate may be sufficient to produce a manure having a given potash content, and phosphatic material, such as bone ash or phosphatic slag, but not superphosphate, may also be added to produce a complete fertiliser.

LATEST NOTIFICATIONS.

138,061. Condensation products of phenols and aldehydes, Process for the pectisation of. L. Jaloustre, Z. Kheifetz, and M. Warchavsky. January 23, 1919.

138,068. Paints or varnishes and methods of making the same. Koppers Co. January 18, 1919.

138,078. Cellulose esters, Dissolved or gelatinised. G. Bonwitt. June 6, 1917.

138,092. Desiccating liquids. Collis Products Co. December 13, 1915.

138,099. Glycerol from sugar. Vereinigte Chemische Werke Akt.-Ges. April 12, 1915.

138,103. Smelting furnaces and the like, Regenerators for. P. Kuhn. May 4, 1918.

138,111. Alkali chromates, Process for isolating or purifying. Soc. Industrielle de Produits Chimiques. August 2, 1917.

138,113. Aldehyde fatty acids from mineral oils and their distillates, Process of making. C. P. Byrnes. January 22, 1919.

138,115. Bleaching, cleaning and decolorising by bleaching earths. V. Schwarzkopf. October 25, 1918.

138,116. Cellulose compositions, Manufacture of. Deutsche Celluloid Fabrik. January 9, 1918.

138,118. Material, Treatment of. By-Products Recovery Co. July 19, 1915.

138,119. Liquids, particularly milk, Treatment of. By-Products Recovery Co. April 11, 1916.

138,124-5-7-8. Coke ovens and the like, Regenerative. American Coke & Chemical Co. January 3, June 22, January 3, and September 15, 1916.

138,126. Coke ovens, retorts and the like, Heating walls of. American Coke & Chemical Co. November 9, 1917.

138,129. Ammonia saturators. American Coke & Chemical Co. April 17, 1915.

Specifications Accepted, with Date of Application

120,381-3-4-5. Arsenical Compounds, Aromatic. Rockefeller Institute for Medical Research. October 3, 1917.

120,546. Ammonia from Atmospheric Nitrogen, Process and Apparatus for the Production of. General Chemical Co. November 3, 1917.

126,951. Metallurgical Reduction Processes. Norsk Hydro-Elektrisk Kvaelstofaktieselskab. May 15, 1918.

128,911. Esters of Ethylenic Halogenhydrins, Process for the Manufacture of. Soc. Chimique des Usines du Rhone. June 26, 1918.

129,974 Ammonium Nitrate Fertilisers. Norsk Hydro-Elektrisk Kvaelstofaktieselskab. July 19, 1918.

133,304. Aliphatic Nitrites, Manufacture of. P. R. de Wilde. September 28, 1918.

137,340. Hydrogen, Manufacture of. Sir H. E. F. Goold-Adams and H. C. Greenwood. January 24, 1918.

137,345. Ammonium Salts, Production of. W. S. Curphey. August 21, 1918.

137,388. Acetic Acid, Process of Recovering—and Manufacturing Acetates. H. W. Matheson. January 23, 1919.

137,396. Citric Acid, Manufacture of. W. J. Mellersh-Jackson (*Citro Chemical Co. of America*). January 30, 1919.

137,399. Cupolas. D. H. Wood and W. H. Wood. August 2, 1919.

Foreign Patents

A law has been passed in Denmark empowering the Minister of Commerce upon terms to be fixed by him to restore Patents which have been cancelled since August 1, 1914, by reason of non-payment of fees or for non-working; to extend the term of a Patent by a period not exceeding 5 years where the patentee has been prevented by the War from exercising his rights; and to reconsider any application the consideration of which was suspended between August 1, 1914, and the end of 1919, owing to official communications remaining unanswered. The benefits of this law may, subject to reciprocity, be extended by Royal Decree to subjects of other countries.

Patents Court Cases.

Announcement is made of the grant of a licence by the Public Trustee under the Trading with the Enemy Act, 1914-1918, to Richard Tilden Smith, 70, Lombard Street, London, E.C. 3, in respect of Patent 23,038, dated June 8, 1911, in the name of J. Gayley. The patent relates to sintering of fine ore.

Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, *and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co. and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The weekly report contains only commodities whose values are at the time of particular interest or of a fluctuating nature. A more complete report and list are published once a month. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.*

Market Report

THURSDAY, FEBRUARY 5, 1920.

The recent activity in the chemical market continues unabated, but with the prevailing scarcity in a large number of products it is becoming increasingly difficult to satisfy buyers' requirements. The market generally is extremely firm with an advancing tendency in a number of directions. The enquiry on export account continues very brisk, but trade has become almost impossible for a large number of commodities, while the movements in the exchange during the current week will further militate against much expansion in the volume of business it is possible to conclude. It will also mean advancing prices for a number of products which are mainly imported from America.

General Chemicals

ACETONE.—There is a better enquiry for this product and prices are very firm.

ACID, ACETIC.—Trade continues very active in this product and prices are again higher.

ACID, CARBOLIC.—This material has become extremely scarce, and price is very firm.

ACID, FORMIC, is on the quiet side, but price is without change.

ACID, GAELIC, is in better request and the price is higher.

ACID, OXALIC, is scarce, and extremely firm. There have been no recent arrivals of foreign material.

ARSENIC shows little change and the price is well maintained.

BARIUM SALTS are moving off very well, and there is quite a brisk demand for chloride.

BLEACHING POWDER continues in request, but little business is possible. Makers are fully sold for months ahead, and are declining to undertake fresh commitments.

CREAM OF TARTAR continues in good request and the price is very firm.

COPPER SULPHATE is rather quiet, but price is fully maintained.

FORMALDEHYDE is again higher, but there are practically no supplies now available.

IRON SULPHATE is moving off very well with quotation unchanged.

LEAD ACETATE is again higher in price, and a further advance is expected on account of the continued increases in cost of raw material.

LEAD NITRATE is also higher in price with a very fair demand.

LITHARGE is in active request, and there is no change in value to record.

LITHOPONE is becoming practically unobtainable on the spot, and the price is steadily advancing.

MAGNESIUM SULPHATE (Epsom Salts) is extremely scarce and makers are heavily committed. Price is very firm.

POTASSIUM BICHROMATE is extremely scarce, and premiums are being paid on makers' prices for resale parcels.

POTASSIUM CHLORATE is in slow demand and price without change.

POTASSIUM NITRATE is in active request at the recent advanced figures.

POTASSIUM PERMANGANATE is very scarce, but price is nominally without change.

POTASSIUM PRUSSIATE.—The price is well maintained at recent quotations and an active business is being transacted.

SODIUM ACETATE is again higher, and price in sympathy with advance in Acetic Acid.

SODIUM BICHROMATE is extremely scarce and high prices are being paid for spot delivery.

SODIUM BISULPHATE has also become very scarce and price is firmer.

SODIUM CAUSTIC is perhaps not quite so much in request, but price is extremely firm.

SODIUM HYPOSULPHITE is difficult to obtain for prompt delivery and the price has a harder tendency.

SODIUM NITRITE becomes increasingly scarce and price again shows an advance on the week.

SODIUM PHOSPHATE is in active request and price is without change.

SODIUM PRUSSIATE is practically unobtainable on the spot, and price continues to rise. Makers are refusing to quote for forward delivery.

SODIUM SULPHIDE is difficult to obtain for near delivery and is extremely firm.

SULPHUR CHLORIDE is in better request at last quoted prices.

ZINC SALTS are all fairly active, and prices are very firm.

Coal Tar Intermediates

There is little change to report in this section. Prompt delivery for the majority of products is out of the question, and consumers are now anxiously endeavouring to cover their requirements well forward. Manufacturers, however, show disinclination to book too far ahead. Values in America continue to advance and with the declining exchange higher prices for imported materials must be paid.

ACETANILIDE is in good request and the price is higher.

ANILINE OIL is extremely scarce for near delivery.

ANILINE SALT is in slightly better supply, probably owing to the fact that the export licences are not being readily granted.

BENZIDINE BASE is extremely scarce, but price is without change

BETA NAPHTHOL is again higher, but makers find it quite impossible to accept any further business over the first half of this year.

PARANITRANILINE.—There is no relief from the present serious shortage.

SALICYLIC ACID is firmer in sympathy with the rise in value of the raw material.

TOLIDINE BASE is badly wanted and supplies are difficult to obtain.

Coal Tar Products

Prices for most Coal Tar Products are still showing an upward tendency.

90's BENZOL.—With the rise of price in petrol the price of this has also gone up, and business is reported in the region of 2s. 6d. f.o.r.

CRESYLIC ACID.—Remains firm at 3s. 4½d. for pale 97/99 per cent. and 2s. 10d. for dark 95/97 per cent.

CREOSOTE OIL is practically unobtainable for prompt delivery, and the price is in the region of 7¾d. f.o.r.

NAPHTHALENE.—The price remains unchanged at about £19 to £20 for refined and £8 to £9 for the crude.

SOLVENT NAPHTHA.—The price is in the region of 3s. 3d.

HEAVY NAPHTHA.—The price is about 2s. 10d.

PITCH.—The market is firm, but business is much restricted owing to difficulties regarding freight, and also owing to the rise in the rates of exchange in France and Belgium.

Sulphate of Ammonia

There is no change in the position.

Current Prices

Chemicals

	per	£	s.	d.		£	s.	d.
Acetic anhydride	lb.	0	3	3	to	0	3	6
Acetone oil	ton	77	0	0	to	80	0	0
Acetone, pure	ton	90	0	0	to	95	0	0
Acid, Acetic, glacial, 99-100%	ton	90	0	0	to	95	0	0
Acetic, 80% pure	ton	75	0	0	to	80	0	0
Arsenic	ton	70	0	0	to	75	0	0
Boric, cryst.	ton	74	10	0	to	76	0	0
Carbolic, cryst. 39-40%	lb.	0	1	2½	to	0	1	3
Citric	lb.	0	4	6	to	0	4	8
Formic, 80%	ton	110	0	0	to	115	0	0
Gallic, pure	lb.	0	7	0	to	0	7	3
Hydrofluoric	lb.	0	0	7	to	0	0	8
Lactic, 50 vol.	ton	65	0	0	to	70	0	0
Lactic, 60 vol.	ton	80	0	0	to	85	0	0
Nitric, 80 Tw.	ton	37	0	0	to	39	0	0
Oxalic	lb.	0	1	10	to	0	1	10½
Phosphoric, 1.5	ton	45	0	0	to	47	10	0
Acid, Pyrogallic, cryst.	lb.	0	11	6	to	0	11	9
Salicylic, Technical	lb.	0	2	9	to	0	3	0
Salicylic, B.P.	lb.	0	3	6	to	0	3	9
Sulphuric, 92-93%	ton	7	10	0	to	8	0	0
Tannic, commercial	lb.	0	4	3	to	0	4	6
Tartaric	lb.	0	3	5½	to	0	3	6½

	per	£	s.	d.		£	s.	d.
Alum, lump	ton	19	10	0	to	20	0	0
Alum, chrome	ton	93	0	0	to	95	0	0
Alumino ferric	ton	9	0	0	to	9	10	0
Aluminium, sulphate, 14-15%	ton	15	0	0	to	15	10	0
Aluminium, sulphate, 17-18%	ton	18	10	0	to	19	0	0
Ammonia, anhydrous	lb.	0	1	9	to	0	2	0
Ammonia, .880	ton	32	10	0	to	37	10	0
Ammonia, .920	ton	20	0	0	to	24	0	0
Ammonia, carbonate	lb.	0	0	7½	to		—	
Ammonia, chloride	ton	70	0	0	to	75	0	0
Ammonia, muriate (galvanisers)	ton	50	0	0	to	52	0	0
Ammonia, nitrate	ton	45	0	0	to	50	0	0
Ammonia, phosphate	ton	130	0	0	to	135	0	0
Ammonia, sulphocyanide	lb.	0	1	10	to	0	2	0
Amyl, acetate	ton	350	0	0	to	360	0	0
Arsenic, white, powdered	ton	70	0	0	to	73	0	0
Barium, carbonate	ton	13	0	0	to	14	0	0
Barium, carbonate, 2- 4%	ton	13	10	0	to	14	10	0
Chlorate	lb.	0	1	3	to	0	1	4
Chloride	ton	24	10	0	to	25	0	0
Nitrate	ton	50	0	0	to	51	0	0
Sulphate, blanc fixe, dry	ton	25	10	0	to	26	0	0
Sulphate, blanc fixe, pulp	ton	15	10	0	to	16	0	0
Bleaching powder, 35-37%	ton	18	0	0	to	18	10	0
Borax crystals	ton	41	0	0	to	42	0	0
Calcium acetate, grey	ton	27	0	0	to	28	0	0
Carbide	ton	28	0	0	to	30	0	0
Chloride	ton	9	0	0	to	9	10	0
Carbon bisulphide	ton	58	0	0	to	59	0	0
Casein, technical	ton	80	0	0	to	83	0	0
Cerium oxalate	lb.	0	3	9	to	0	4	0
Chromium acetate	lb.	0	1	0	to	0	1	2
Cobalt acetate	lb.	0	7	0	to	0	7	6
Oxide, black	lb.	0	7	9	to	0	8	0
Copper chloride	lb.	0	1	3	to	0	1	6
Sulphate	ton	50	0	0	to	51	0	0
Cream Tartar, 98-100%	ton	287	10	0	to	292	10	0
Epsom salts (*see* Magnesium sulphate)								
Formaldehyde 40% vol.	ton	280	0	0	to	290	0	0
Formusol (Rongalite)	lb.	0	4	0	to	0	4	3
Glauber salts	ton	3	10	0	to	3	15	0
Glycerine, crude	ton	70	0	0	to	72	10	0
Hydrogen peroxide, 12 vols.	gal.	0	2	9	to	0	2	10
Iron perchloride	ton	40	0	0	to	42	0	0
Iron sulphate (Copperas)	ton	4	10	0	to	4	15	0
Lead acetate, white	ton	100	0	0	to	105	0	0
Carbonate (White Lead)	ton	70	0	0	to	72	10	0
Nitrate	ton	80	0	0	to	85	0	0
Litharge	ton	66	0	0	to	70	0	0
Lithophone, 30%	ton	50	0	0	to	54	0	0
Magnesium chloride	ton	15	10	0	to	16	10	0
Carbonate, light	cwt.	2	15	0	to	3	0	0
Sulphate (Epsom salts commercial)	ton	13	0	0	to	13	10	0
Sulphate (Druggists')	ton	17	10	0	to	18	0	0
Methyl acetone	ton	89	0	0	to	90	0	0
Alcohol, 1% acetone	gall.	0	11	6	to	0	12	0
Nickel ammonium sulphate, single salt	ton	47	10	0	to	52	10	0
Potassium bichromate	lb.	0	1	6	to	0	1	7
Carbonate, 90%	ton	102	0	0	to	105	0	0
Chloride	ton	Nominal.						
Potassium Chlorate	lb.	0	1	1	to	0	1	2
Meta-bisulphite, 50-52%	ton	250	0	0	to	260	0	0
Nitrate, refined	ton	68	0	0	to	70	0	0
Permanganate	lb.	0	4	9	to	0	5	0
Prussiate, red	lb.	0	6	0	to	0	6	3
Prussiate, yellow	lb.	0	2	2	to	0	2	4
Sulphate, 90%	ton	31	0	0	to	33	0	0
Salammoniac, firsts	cwt.	4	15	0	to		—	
Seconds	cwt.	4	10	0	to		—	
Sodium acetate	ton	53	0	0	to	55	0	0
Arsenate, 45%	ton	50	0	0	to	52	0	0
Bicarbonate	ton	10	10	0	to	11	10	0
Bichromate	lb.	0	1	0	to	0	1	1
Bisulphite, 60-62%	ton	40	0	0	to	42	0	0
Chlorate	lb.	0	0	6	to	0	0	6¼
Caustic, 70%	ton	30	0	0	to	31	0	0
Caustic, 76%	ton	31	0	0	to	32	0	0
Hydrosulphite, powder, 85%	lb.	0	3	3	to	0	3	6
Hyposulphite, commercial	ton	22	0	0	to	23	0	0
Nitrite, 96-98%	ton	75	0	0	to	77	10	0
Phosphate, crystal	ton	36	0	0	to	38	0	0
Sodium, Perborate	lb.	0	2	1	to	0	2	2
Prussiate	lb.	0	1	8	to	0	1	10
Sulphide, crystals	ton	17	10	0	to	18	10	0
Sulphide, solid, 60-62%	ton	31	10	0	to	33	10	0
Sulphite, cryst.	ton	12	0	0	to	12	10	0

	per	£	s.	d.		£	s.	d.
Strontium, carbonate	ton	85	0	0	to	90	0	0
Nitrate	ton	85	0	0	to	90	0	0
Sulphate, white	ton	8	10	0	to	10	0	0
Sulphur chloride	ton	40	0	0	to	42	10	0
Sulphur, Flowers	ton	24	0	0	to	26	0	0
Roll	ton	23	0	0	to	25	0	0
Tartar emetic	lb.	0	3	4	to	0	3	6
Tin perchloride, 33%	lb.	0	2	6	to	0	2	7
Perchloride, solid	lb.	0	2	10	to	0	3	0
Protochloride (tin crystals)	lb.	0	1	10	to	0	1	11
Zinc chloride, 102 Tw.	ton	24	0	0	to	25	10	0
Chloride, solid, 96-98%	ton	50	0	0	to	52	10	0
Oxide, 99%	ton	77	10	0	to	80	0	0
Oxide, 94-95%	ton	60	0	0	to	62	10	0
Dust, 90%	ton	70	0	0	to	72	10	0
Sulphate	ton	22	10	0	to	23	10	0
Oxide, Redseal	ton	75	0	0	to	80	0	0

Coal Tar Intermediates, &c.

	per	£	s.	d.		£	s.	d.
Alphanaphthol, crude	lb.	0	3	3	to	0	3	9
Alphanaphthol, refined	lb.	0	3	9	to	0	4	0
Alphanaphthylamine	lb.	0	3	6	to	0	3	9
Aniline oil, drums extra	lb.	0	1	7	to	0	1	8
Aniline salts	lb.	0	1	10	to	0	2	0
Anthracene, 85-90%	lb.	0	1	5	to	0	1	6
Benzaldehyde (free of chlorine)	lb.	0	6	0	to	0	6	6
Benzidine, base	lb.	0	12	6	to	0	13	0
Benzidine, sulphate	lb.	0	10	0	to	0	11	0
Benzoic, acid	lb.	0	5	0	to	0	5	3
Benzoate of soda	lb.	0	5	0	to	0	5	3
Benzyl chloride, technical	lb.	0	2	3	to	0	2	6
Betanaphthol benzoate	lb.	1	6	0	to	1	7	6
Betanaphthol	lb.	0	3	9	to	0	4	0
Betanaphthylamine, technical	lb.	0	8	0	to	0	8	6
Croceine Acid, 100% basis	lb.	0	4	9	to	0	5	0
Dichlorbenzol	lb.	0	0	6	to	0	0	7
Diethylaniline	lb.	0	7	0	to	0	7	6
Dinitrobenzol	lb.	0	1	3	to	0	1	4
Dinitrochlorbenzol	lb.	0	1	3	to	0	1	4
Dinitronaphthaline	lb.	0	1	4	to	0	1	6
Dinitrotoluol	lb.	0	1	7	to	0	1	8
Dinitrophenol	lb.	0	1	6	to	0	1	9
Dimethylaniline	lb.	0	4	6	to	0	4	9
Diphenylamine	lb.	0	4	6	to	0	4	9
H-Acid	lb.	0	12	6	to	0	13	6
Metaphenylenediamine	lb.	0	5	0	to	0	5	3
Monochlorbenzol	lb.	0	0	9	to	0	0	10
Metanilic Acid	lb.	0	7	6	to	0	8	6
Monosulphonic Acid (2:7)	lb.	0	7	0	to	0	8	0
Naphthionic acid, crude	lb.	0	4	3	to	0	4	6
Naphthionate of Soda	lb.	0	4	9	to	0	5	0
Naphthylamin-di-sulphonic-acid	lb.	0	4	9	to	0	5	0
Nitronaphthaline	lb.	0	1	4	to	0	1	5
Nitrobenzol	lb.	0	0	10½	to	0	0	11½
Nitrotoluol	lb.	0	1	3	to	0	1	6
Orthoamidophenol, base	lb.	0	18	0	to	1	0	0
Orthodichlorbenzol	lb.	0	1	1	to	0	1	3
Orthotoluidine	lb.	0	2	6	to	0	2	9
Orthonitrotoluol	lb.	0	1	6	to	0	1	9
Para-amidophenol, base	lb.	0	14	0	to	0	15	0
Para-amidophenol, hydrochlor	lb	0	15	6	to	0	16	0
Paradichlorbenzol	lb.	0	0	4	to	0	0	5
Paranitraniline	lb.	0	5	6	to	0	6	0
Paranitrophenol	lb.	0	3	9	to	0	4	0
Paranitrotoluol	lb.	0	5	3	to	0	5	6
Paraphenylenediamine, distilled	lb.	0	13	6	to	0	14	0
Paratoluidine	lb.	0	7	6	to	0	7	9
Phthalic anhydride	lb.	0	11	6	to	0	12	6
R. Salt, 100% basis	lb.	0	5	0	to	0	5	6
Resorcin, technical	lb.	0	11	0	to	0	12	0
Resorcin, pure	lb.	0	17	6	to	1	0	0
Salol	lb.	0	4	9	to	0	5	6
Shaeffer acid, 100% basis	lb.	0	4	0	to	0	4	6
Sulphanilic acid, crude	lb.	0	1	6	to	0	1	8
Tolidine, base	lb.	0	12	0	to	0	12	6
Tolidine, mixture	lb.	0	2	9	to	0	3	0

IN CONNECTION WITH the proposed establishment of a Refractories Department at the Brierley Hill Technical Institute, a joint meeting of Stourbridge and District Wages and Conciliation Board was held at Stourbridge on Wednesday, January 28. The British Refractories Research Association was represented by Sir William Jones and Dr. J. W. Mellor; the Stourbridge manufacturers by Mr. W. Fullwood and Lieut.-Col. C. W. Thomas; and the operatives by Mr. J. C. Mason. Sir William Jones pointed out that the Refractories Research Association did not wish to compete in any way with local enterprise, but would do all they could to assist it. The Stourbridge firebrick manufacturers are to be called together shortly to consider the proposals for the establishment of the refractories department.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

Locality of Firm or Agent.	Materials.	Ref. No.
Canada	Mica	—
Paris	Chemical Products	173
Athens	Quinine. The export of quinine sulphate from the United Kingdom is at present prohibited except under licence, applications for which should be submitted to the Export Licensing Section, Board of Trade, Great George Street, London, S.W.1. At the present rate of exchange 26·60 drachma = £1.	

The following prizes in chemistry are proposed by the Paris Academy of Sciences for 1921: The Montyon prize (unhealthy trades) (a prize of 2,500 francs and a mention of 1,500 francs), for the discovery of a means of rendering some mechanical art less unhealthy; the Jecker prize (10,000 francs), for work in organic chemistry; the Cahours prize (3,000 francs), for encouraging young workers already known by their chemical researches; the Berthelot prize (500 francs), for researches in chemical synthesis; the Houzeau prize (700 francs), for a young deserving chemist.

The import of soda and soda ashes during last month showed a remarkable decrease. According to the returns of Soda and Bleaching Powder Merchants' Association, the total import of caustic soda during the period was 8,950 drammes, of which 6,322 drammes came from the United States, 1,532 drammes from England, and 1,096 drammes from other countries. The import of soda ashes for the same period was 4,754 bags, 2,588 bags from the United States, and 2,166 bags from England. Compared with the importation for October, the former shows a decrease of 10,075 drammes, or 112 per cent., while the latter increased 314 bags. The conspicuous decrease in the volume of caustic soda imports, it is believed, will have good effect by improving the market price of the goods, which has gone down considerably recently.

At a discussion on the "Merits and Defects of the British Health Resorts," opened last week by Dr. Neville Wood at the Royal Society of Medicine, Wimpole Street, London, Dr. C. F. Sonutag pointed out the neglected state of scientific research at British health resorts. One could hardly wonder, he said, at the neglected state of experimental work, for the conditions necessary for first-class research were absent from most of the spas. Many of the important effects of waters and climates were not investigated, and experimental work would probably prove that some of the so-called actions of therapeutic agents were incorrect. He suggested that attractive financial conditions and properly equipped laboratories should be offered to encourage good scientists. A move was being made in the right direction at Harrogate, where a pathologist, a bacteriologist and an analytical chemist had been appointed to investigate the effects of treatment, and the nature of the waters.

The cause of the increase of 8d. per gallon in the price of petrol, which came into operation on Wednesday, is explained by the directors of the "Shell" Marketing Co. So overwhelmingly is America the largest producer of motor spirit in the world that the market price, they state, must necessarily be dominated by the price at which petrol can be purchased in that country. The present wholesale buying price of motor spirit of a grade from 10 per cent. to 20 per cent. lower than "Shell" is, at the present rate of exchange, equivalent to 1s. 8½d. per imperial gallon in America before it is put on board ship. Since British petrol prices were last reduced, the loss on the American exchange has represented no less than 4½d. per gallon. In addition, the market price in America has gone up, and ocean freighage has advanced enormously, the last freight paid representing approximately 9d. per gallon. In the new price only half this figure is allowed. Thus, the present cost of petrol per gallon is made up as follows:—

	s.	d.
Cost f.o.b. New York	1	8½
Ocean freight	0	4½
Railway freight and distribution	0	7
Duty	0	6
Garage profit	0	4½
	3	6½
5 per cent. to distributors	0	2
	3	8½

Soap Export During the War

Judges' Comments on "A Miserable Business"

Mr. Justice Rowlatt, in the King's Bench Division on Jan. 28th, gave judgment in the action brought by John Henry Fish, of The Grove, Palmer's Green, against E. H. Jones & Meakin, Ltd., merchants and soap dealers of Arthur Street, E.C., claiming £114 balance of account for the price of soap sold and delivered and an account showing the amount due to plaintiff in regard to soap transactions. (Reported in The Chemical Age last week, page 126.) Defendants denied that anything was due by them and alleged that plaintiff had broken his contract to supply them with soap. They therefore brought a counterclaim for damages for breach of contract.

Mr. Schawbe, K.C., for the defendants, said their first point was whether the contract of October 4 was entered into or not. It was a contract for soap at different prices—48s. 6d. and 49s. 5d.—and on October 10 plaintiff purported to confirm, subject to alteration of prices. Defendants' evidence was that they never agreed to that; it was a sale in the ordinary way. There was an interview after the letter of October 10 and plaintiff proceeded to deliver, at a late date, at the price of 49s. 5d. The second point was, were the deliveries of outstanding contracts cancelled as far as Watsons were concerned by the contract of October 5th, or as regards the Sunlight Soap by the contract of October 12? The question arose as to whether there was a merging of the outstanding Sunlight contract. Defendants contended that there was a clear breach of the outstanding contracts, for which they were entitled to damages. So far as the Watsons' contract was concerned, he had delivered 1,996 cases instead of 5,000, thus committing a breach of contract with respect to 3,004 cases.

Mr. Doughty (for the plaintiff) remarked that there was a direct conflict of evidence as to whether the contracts were merged in the arrangements of October 3 and 11.

His Lordship stigmatised the case as a miserable one arising out of a miserable business which was not conducted in anything like a business way. In 1917 there was a great shortage of soap, especially for export, and manufacturers of soap, especially Messrs. Lever Brothers, manufacturers of Sunlight Soap, and Messrs. Watson, manufacturers of Watson's Matchless Cleanser, were minded to distinguish somewhat distinctly between soap for export and soap for home consumption. It might be said, and probably would be said by these great persons that they were allocating soap to the home trade in order that the home consumer would not be without soap, but it was also said in another part of the case that they did not care at all what happened to the consumer except in so far as it affected themselves. Whatever the reason it was clear that they were selling to the home trade goods which the home people were not expected to sell for export. Under those circumstances the price for export became so high that it apparently paid any person, or persons, who probably had no sort of regard for the interests of the rest of the community in this country to buy off the home market at exorbitant prices soap intended for the home supply and to export it abroad. In furtherance of that plan the present defendants entered into an arrangement with the plaintiff (a traveller for Messrs. Watson) and they embarked on a scheme for doing something which was not very honest. Messrs. Watson certainly had the right to expect that one of their travellers would not be employed in purchasing soap from home consumers, thus causing a deficiency in that quarter. Mr. Fish contracted to sell the defendants the soap, but in October another arrangement was made whereby he was to supply them with goods at the price at which he bought them, and when defendants sold them the difference between the buying and selling price was to be divided. Under that arrangement no price, of course, was mentioned. His Lordship regarded this as merely a commission to the plaintiff. The whole question was whether at the interview of October 3 the outstanding balance of former contracts was transferred to the new basis. The documents as to that were unsatisfactory and utterly confused, but he regarded Mr. Fish as a good witness, and he accepted his evidence that he did not regard the arrangement as suggested by the defendants. He was not prepared to say that plaintiff was under any obligation to deliver anything at all. Plaintiff was entitled to £114 for goods which he had delivered and for which he had not been paid. He was also entitled to a partnership account of the business and of the sales of the goods by the defendants so that he could get his share of the resulting profit. The counterclaim by defendants for damages failed and would be dismissed. Judgment would be entered for the plaintiff, with costs.

Books Received

A Class Book of Organic Chemistry. Vol. II. For second-year medical students and others. By J. B. Cohen, Ph.D., B.Sc., F.R.S. Macmillan & Co., London. Pp. 156. 4s. 6d.

Annual Report of the Director, Bureau of Standards to the Secretary of Commerce (U.S.A.). Fiscal year ended June 30, 1919. U.S.A. Government Printing Office, Washington. Pp. 293.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

London Gazette

Company Winding Up Voluntarily

BRITISH CHEMICAL PLUMBERS SUPPLY, LTD.—Liquidator Mr. William Gamble, Derby Street East, Burton-on-Trent.

Notice of Intended Dividends

ANGLO-CUBAN OIL BITUMEN & ASPHALT CO., LTD., 513, Salisbury House, London. February 14. Liquidator, H. de Vaux Brougham, Senior Official Receiver and Liquidator, 33, Carey Street, Lincoln's Inn, W.C.

HEESCH, ERNEST EDWIN FERDINAND (now trading under the style of the Gatap Co.), residing at 59, Clarendon Road, and trading at Stansfield Mill Yard, 77 and 79, Kirkstall Road, Leeds, oxy-acetylene welder and chemical manufacturer. February 14. Trustee, H. C. Bowling, Official Receiver, 24, Bond Street, Leeds.

RING, HAROLD (trading as Harold Ray & Co.), Oakleigh, Western Road, Flixton, Cheshire, trading at 5, Cheapside, Manchester, chemical merchant. February 14. Trustee, J. G. Gibson, Official Receiver, Byrom Street, Manchester.

Mortgages and Charges

[*NOTE.—The Companies Consolidation Act, of* 1908, *provides that every Mortgage or Charge, as described therein, created after July* 1, 1908, *shall be registered within* 21 *days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges which would, if created after July* 1, 1908, *require registration. The following Mortgages and Charges have been so registered. In each case the total debt, as specified, in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced since such date.*]

ALUMINIUM CORPORATION LTD., LONDON, E.C.—Registered January 19, £1,800 mortgage, to Sir H. A. Walker, Kt, 2, Maresfield Gardens, Hampstead; charged on premises and cottage, &c., at Maenan (Carnarvon). *£324,575. July 14, 1919.

ANGLO-PERSIAN OIL CO., LTD., LONDON, E.C.—Registered January 23, Trust Deed (supplemental to a Trust Deed dated May 25, 1909, and a deed dated March 25, 1918), securing £2,600,000 debenture stock; general charge. *£2,400,000. December 30, 1918.

BURGUNDY POWDER & CHEMICALS, LTD., LONDON, E.C.—Registered January 21, £1,000 debentures, to Col. D. J. Smith, 40, Woodberry Grove, Finsbury Park; general charge. *£1,000 November 10, 1919.

County Court Judgments

NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.]

ASHLEY, HERBERT, Wouldham Hall, nr. Rochester, oil company's manager. £11 19s. 1d. and £23 13s. 10d. December 30.

WATTERSON, THOMAS HENRY, 259, Great Homer Street, Liverpool, chemist. £36 12s. December 15.

JACOBSON (L.) & CO., LTD., R/O, 79, Coleman Street, E.C., chemical merchants. £22 18. 6d. December 30.

NOBLES DRUG STORES, 2, Well Street, Cable Street, E., chemists. £11 6s. 6d. December 22.

Colnbrook Chemical and Explosives

The following have been appointed a Committee of Inspection to act with the Official Receiver as Liquidator of the Colnbrook Chemical and Explosives Co., Ltd.: E. Manville, M.P., A. E. Messer, C. J. Goodwin, C. D'Oyley Cooper and F. H. Rogers.

WITH REFERENCE to the statement in THE CHEMICAL AGE of January 17 that the first edition of the Nitrogen Products report was reported to be sold out, we learn from the Ministry of Munitions that this is not the case. It is possible, it is stated, that some of the sale depots may have disposed of all the copies allocated to them in the first instance, but there are plenty more available on demand. Inquiries at H.M. Stationery Offices confirm this statement, though several instances had previously come to our knowledge of failure to obtain copies.

Company News

MOROCCO MINERALS SYNDICATE.—15,000 new shares of £1 each are offered pro rata to shareholders registered on January 29 at the price of £2 10s. per share.

DALMELLINGTON IRON.—An interim dividend of 9d. per share, free of tax, has been declared, being at the rate of 7½ per cent. per annum on ordinary shares.

AMMONIA SODA CO.—The liquidator proposes to repay the capital of the preference shareholders together with arrears (one year) of preference dividend.

STANTON COAL & IRON CO.—This company has purchased for £250,000 the Alfreton Ironworks, which has been worked as a private concern. It was here that paraffin oil was first discovered.

GAS LIGHT & COKE CO.—Dividends of 2½ per cent. per annum on the 3½ per cent. maximum stock and 3 per cent. on the ordinary stock have been declared for the half-year to December 31, 1919.

MONS CUPRI COPPER.—The Board propose to submit resolutions to the shareholders at an extraordinary general meeting relating to the creation of new shares with a view to providing further working capital.

SCOTTISH-AMERICAN OIL CO.—The directors propose to increase the company's capital to £10,000,000 by the creation and issue of 5,000,000 new shares of £1 each, ranking equally with the existing shares.

MAJOR & CO.—A further dividend of 7 per cent. has been declared on the old preferred ordinary shares for the six months ended December 31, and 7 per cent. on the new shares from June 1 last to December 31.

SOUTH AMERICAN COPPER SYNDICATE.—At an extraordinary general meeting held last week, it was resolved to increase the authorised capital of the company to £50,000 by the creation of a further 100,000 shares of 2s. each.

MAZAPIL COPPER CO.—The directors propose to increase the capital to £1,000,000 by the creation of 500,000 new shares of £1 each, and to capitalise £100,000 from undivided profits and distribute the same as bonus to shareholders.

BOOTLE COLD STORAGE & ICE.—In the report for the year 1919 the directors, after payment of debenture interest and preference dividend, and after setting aside further sums to reserve accounts, recommend a dividend of 10 per cent. on the ordinary capital and a bonus of 3 per cent. on both the ordinary and preference capital.

PARKE'S DRUG STORES.—The report for the year to Sept. 30 shows an available balance of £17,652, after appropriating £856 to the fixture depreciation and reserve fund, and adding £1,230 to the stock reserve fund. The directors recommend a final dividend of 5 per cent., free of tax, on the ordinary shares, making 10 per cent., free of tax, for the year.

AMALGAMATED ZINC (DE BAVAY'S).—Including the revenue derived from dividends on shares in other companies, &c., and after deducting various charges, the balance transferred from profit and loss account to appropriation account was £44,358. Out of this amount a dividend of 5 per cent., absorbing £25,000, was paid, a sum of £9,743 was transferred to reserve for depreciation, and the balance placed to equalisation reserve.

ROYAL DUTCH PETROLEUM.—N. M. Rothschild & Sons announce that they are prepared to receive the letters of allotment of the 1919 issue of the Royal Dutch Petroleum Co. to be exchanged for the definitive share and sub-share certificates, which will be issued with Coupon No. 46 and following. The letters of allotment, which must be left three clear days for examination, will be received daily (Saturdays excepted) between 11 and 2. Forms for listing the letters can be obtained on application.

GAS LIGHT & COKE CO.—The accounts for the year 1919 show a total balance of £568,456 after providing for the payment of 3 per cent. per annum on the ordinary stock for the June half-year, and of 2 $\frac{11}{16}$ and 2½ per cent. per annum on the 3½ per cent. maximum stock for the June and December half-years respectively, and allowing for fixed charges. Out of this sum the directors recommend a dividend on the ordinary stock for the December half-year of 3 per cent. per annum, payable March 1, leaving £323,971 to be carried forward.

A NATIONAL CONFERENCE of manufacturers and producers will be held at Kingsway Hall, London, for two days, beginning at 10.30 a.m., on February 10. The chairman will be Mr. W. Peter Rylands (president of the Federation of British Industries), and the deputy chairman, Mr. E. Manville, M.P. (president of the Association of British Chambers of Commerce). All the important associations of manufacturers and producers are taking part, including the Glass Bottle Manufacturers' Association, the Chemical Manufacturers' Association, the Bleachers' Association, and the Yorkshire Dyers' Federation. The following are the subjects up for discussion on the first day after the chairman's opening speech: Export Trade and Foreign Exchanges; Prices and Profits; Government Finance and Expenditure. The subjects for discussion on the second day are as follows: Nationalisation, Transport, Fuel, Education, Research, Housing.

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NOTE.—For particulars of other Government Property for Sale, see "SURPLUS," price 3d. at all bookstalls, or by quarterly subscription of 2s. post free, payable in advance to the Director of Publicity, Ministry of Munitions, Whitehall Place, London, S.W.1.

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